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THE HEATING AND VENTILATING MAGAZINE

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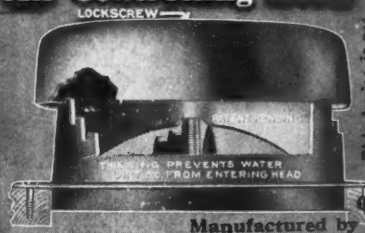

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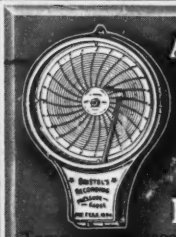

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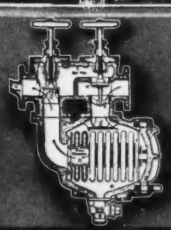

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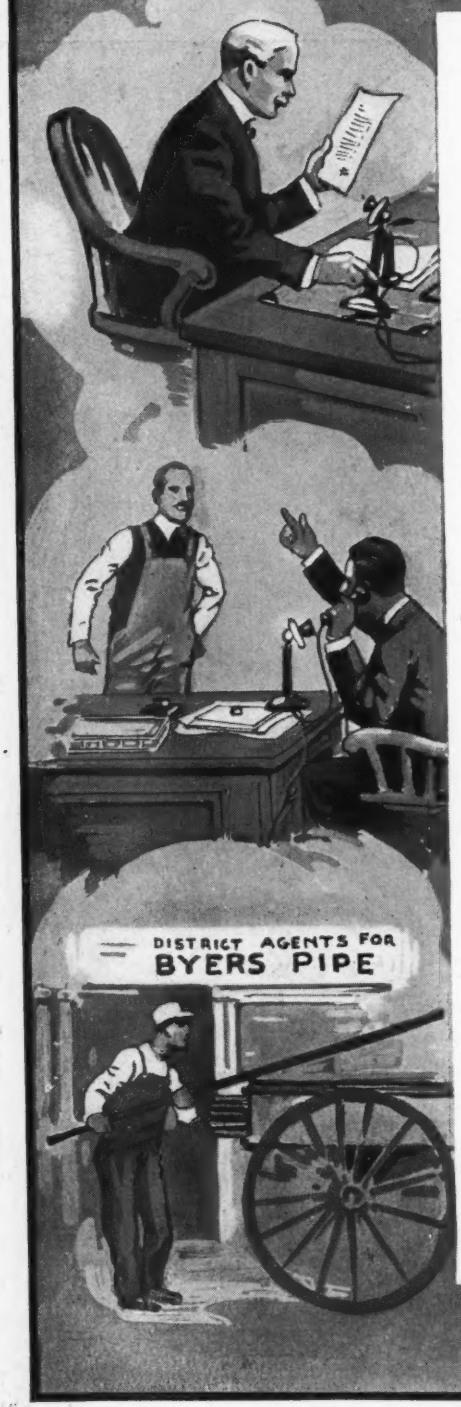

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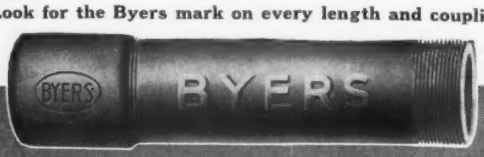

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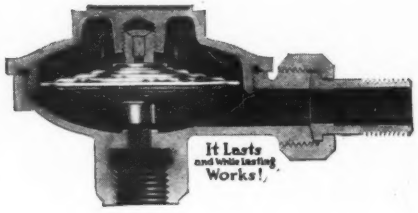

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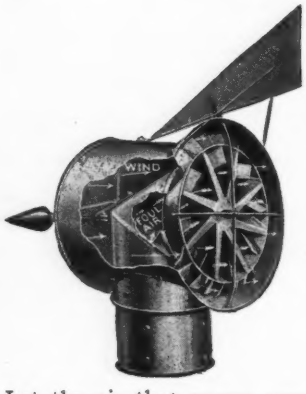

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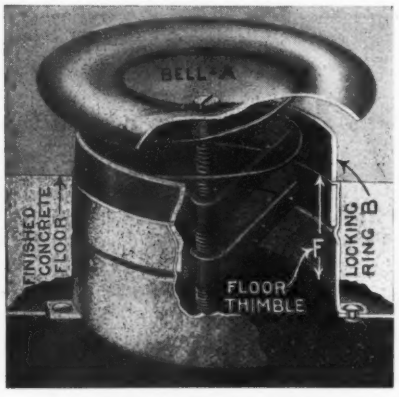

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Note projection of cap which deflects the air towards the floor, thereby eliminating draughts. Compare with other caps.

THE HEATING AND VENTILATING MAGAZINE

1123 BROADWAY NEW YORK AUGUST, 1914

Piping Troubles in Steam Heating Work

DIFFICULTIES EXPERIENCED IN CHANGING OVER A STEAM HEATING SYSTEM FROM GRAVITY TO VACUUM.

BY T. W. REYNOLDS.

The difficulties which arise in connection with the heating of an old plant are probably never fully realized except by the trouble hunter himself. A typical illustration of this statement is to be found in the case of a large railroad and ferry terminal adjacent to New York City. The heating system for this terminal, formerly known as a gravity return line system, was changed to a vacuum return line system.

DESCRIPTION OF BUILDINGS.

The terminal comprises a ferry waiting room, kitchen and restaurant, offices and wash rooms, express rooms, immigrant waiting room and a general waiting room, with adjoining ticket offices, smoking rooms, toilet rooms, etc. Over these rooms are situated the varius offices of the Pullman Company, the express company and the railroads which enter the terminal. Some of these offices have several exposures and are located directly over open passages used by teams and passengers. It is a difficult matter to satisfactorily heat the offices at these points during cold weather with high winds, as the velocity of the wind becomes greater as it enters these passageways.

The buildings are about 90 ft. wide and 34 ft. high, with rooms on the first floor 20 ft. high and those on the second floor 12 ft. high. with the exception of the general waiting room. The total ground area embraced by this group of buildings is 50,000 sq. ft.

INSUFFICIENT RADIATION.

The total radiation installed is 10,000 sq. ft. This amount is far from sufficient to heat the buildings to 70° F. in zero weather, as may be seen by glancing at the following table giving the total square feet of conducting surfaces and total cubical contents of all the terminal buildings. (About 10,000 sq. ft. of radiation should be added to this installation to heat the buildings satisfactorily).

Cubical contents, 1,003,500 cu. ft.
Glass, 8,140 sq. ft.
Skylight, 1,060 sq. ft.
Floor, 40,000 sq. ft.
Wall, 31,400 sq. ft.
Roof, 38,320 sq. ft.
Doors, 1,320 sq. ft.

The boiler house is situated 250 ft. south of the terminal buildings and contains a compressor which supplies exhaust steam for heating. This is supplemented by live steam through a reducing valve when the compressor is not running at its usual speed. The exhaust steam is also used for heating water in the feed water heater. When the exhaust steam exceeds the heating requirements it is allowed to escape to the atmosphere through a back pressure valve.

Live steam is obtained from boilers used primarily for power purposes, each

supplying steam for operating an air compressor, fire pumps, boiler feed and vacuum pumps, and for the heating of cars while standing in the terminal yard, and for various other uses about the yard; also for heating the storerooms at the ferry slips. The latter are run along the east side of the concourse and have no connection with the vacuum return line system.

ARRANGEMENT OF PIPING FOR HEATING SYSTEM.

Steam is supplied to the vacuum return system by an overhead 6-in. main as far as the first building (250 ft.), at which point it increases to 8 in. and continues as a supply header, gradually reducing in size to the end of its run, 400 ft. distant, making a total run of 650 ft. At this point the main divides with one branch running 170 ft. west and the other branch running 100 ft. east. Branches having 100-ft. runs are taken off of the 8-in. header to supply the buildings along the west side of the concourse.

The main return and branch returns are divided and run approximately as the supply main and its branches. The former are located under the floor of the building and the returns from radiators on the second floor are connected directly into these. The main return is 2-in. in size, increasing to 2½-in. south of the terminal. At the latter point it increases to 3-in. and runs underground to the boiler house.

The condensation flows by gravity to the vacuum pump and is discharged to an air-separating tank from which it flows by gravity to a feed water heater and is pumped back into the boilers, as is usual with this type of system (Positive Differential System).

Two 5½-in. x 8 in. by 7 in. Blake-Knowles direct-acting horizontal steam heating vacuum pumps, of the double-acting piston type, were installed in a pit in a lean-too adjacent to the boiler house. One pump is always held in reserve and either one is capable of removing the air and hot water of condensation from 20,000 sq. ft. of radiation.

This heating plant when formerly operated as a gravity return system proved very troublesome. In severe weather the steam in the heating system had to be supplemented by steam obtained from a locomotive in the yard. The average pressure carried on the system was about 10 lbs. and this was raised to a maximum of 20 lbs. at times in order to flush out the lines which were pocketed to a considerable extent. These pockets caused further troubles by occasionally freezing.

ADOPTION OF VACUUM HEATING DUE TO INSTALLATION OF AIR COMPRESSOR.

It was the installation of an air compressor in the boiler house to compress air for yard usage which finally solved the problem. At first it was proposed to install an electric-driven compressor, but the conclusion was reached that a steam-driven compressor would be more economical as the exhaust could be used in the heating system. In order to circulate this exhaust steam properly, it was necessary that a vacuum return system be installed, as the piping was undersize and in poor condition.

For several reasons it was found necessary to install two locomotive type boilers of 150 H. P. each, for use in connection with the fire pump. The piping from these boilers was coupled up to the old piping of the three Scotch marine boilers (125 H. P. each), the arrangement being such that it was possible for the locomotive boilers working at high pressure to become connected to the boilers intended only for low pressures. The physical arrangement of the plant is such that it is important to be able to use the boilers together on account of the heavy drag on the car heating system. Some of the old fittings were discarded when the compressor was installed, as it was thought likely that considerable vibration might be set up in the old steam piping because the old fittings were too light.

PIPING AND COILS IN POOR CONDITION.

As already stated the piping and pipe coils were generally not in good condition, having been in for years. This applied particularly to the returns under the floor and to all pipes in the attics and at other points not readily accessible. Doubtless these pipes were supported by hangers at one time. The few supports which still existed were but makeshifts, consisting usually of a piece of wire, a block of wood or any other available ma-

terial which the steamfitter had found close at hand. These supports were spaced about 30 ft. apart.

The pipes being small in size were not very rigid, consequently low points were formed midway between hangers. These low points were very efficient air-traps, and were, therefore, a decided disadvantage in obtaining equal results in all parts of the system.

Possibly the manufacturers of vacuum valves and appliances are to some extent responsible for the continued existence of these pockets, as they have frequently claimed that one of the advantages to be gained by the installation of a vacuum system is that such low points can do no harm as the water of condensation will be lifted by the vacuum carried in the returns. No doubt this is true, in a measure, but where such pockets exist in an old plant, or in what might be properly termed "mad piping," the heating of radiating surfaces is not uniform. The amount of steam which can flow through undersized pipes for a certain length of time is limited. Steam will follow the line of least resistance, which is through the pipes which are properly pitched and supported. Water may be lifted to any height permitted by the vacuum when lifting pockets are installed. Many of the pipes in this system were devoid of all grade and had been merely laid on the top of beams.

EFFECT OF SETTLING OF BUILDINGS.

That portion of the buildings which fronts on the concourse, and is nearest the river, frequently settled. This necessitated the jacking up of the floors at these points at least once a year. As a consequence the branch returns under the floor at the points where they connected to the main return were lifted where they were supposed to be the lowest. The main return was also affected as the buildings were not raised equally at all points. Had this occurred on the track side of the terminal no harm could have been done, as the lifting of returns at that end would have given them a better grade toward the main return.

It was not a rare occurrence for ferry boats to enter the slips at too great a speed, which sometimes resulted in the buckling of the floors with consequent damage to the alignment of the returns which were supported from these floors. This was not done thoughtlessly, for it was sometimes necessary during the winter that the ferry slips be cleared of floating ice in order that the boats might discharge their passengers quickly. This was best affected by ramming the ice several times by the ferry boat itself, thus forcing the ice out of the slip.

Thus it will be readily seen that the maintenance of this piping in good condition was a discouraging task. If not attended to yearly, the troubles soon accumulated to the extent that further damages were left as found.

The work under the floor was done at intervals only, as it frequently happened that when men could be spared for this work low tide would not arrive until closing hours, or so near to it, that not enough time was available for work to be started, and then temporarily connected up again. The ground under the floor was always inundated at high tide. Rain made the conditions worse. The place was difficult to work in at its best, with its few feet of headroom, no sunlight, and the odors from escaping back pressure in sewers (due to the high tide) was dangerous. Furthermore the work was frequently abandoned for emergency calls elsewhere which those who are familiar with railroad work can best appreciate. Piping around railroad property, because of its location, is necessarily exposed, and subjected to hard usage. In severe weather every available steamfitter is in demand.

In determining the proper grade of these pipes, one could not be guided by the eye alone, as the building was out of plumb. A pitch of ½ in. in 10 ft. could not always be obtained, and where this occurred the pipes were graded as well as possible under the circumstances.

PERIODICAL ADDITIONS MADE TO PIPING.

The piping had been extended from time to time as additional radiation was installed. Connections were then made to the mains at any convenient point, which was not always the nearest. Emphasis should be laid on this point. In designing heating systems for locations of this nature where the future may mean enlargement of the buildings, or additions thereto, plugged tees should be left at various points. Where a main

changes its direction and an elbow would ordinarily be used, a plugged tee might be used instead. This often means a saving in the cost of additional installations and the efficiency of operation in later years. Likewise the liberal use of valves, especially with the smaller sizes of piping where the cost per valve would not be high, will often result in a decided advantage by securing a more flexible control of the system. The writer has frequently noted numerous joints from which steam escaped day and night and which could not be repaired without shutting down the plant on account of the lack of valves properly distributed. The leaks generally occur in lines where no provision has been made for expansion by an expansion joint, or change in direction of the pipe, etc. Naturally the expansion is greater where the lines are exposed to the weather, as the temperature difference is greater.

The use of plugged tees and valves, however, may sometimes be overdone, as these increase the maintenance and the number of points at which leaks might occur. These may be things which are generally known, but then how can one account for such bad practices which seem to exist in every old installation, and which may occasionally be seen in newly erected jobs? By-passes around reducing valves, meters, etc., are not always provided. Accordingly such appliances are run as best as possible in an inefficient condition, as the necessary attention which should be given them would result in a greater inconvenience elsewhere. A by-pass to the sewer should certainly be provided at a vacuum pump.

LEAKY JOINTS AND WATER HAMMER.

In starting up the system, leaky joints are sometimes caused by the admission of steam too quickly into the main, causing water hammer. The condensed steam (water) is forced ahead by the steam rushing into the cold empty pipe with such high velocity that it slams the water against bends, elbows, valves, etc., with terrific force or shock. Water hammer is peculiarly violent when steam is admitted suddenly to a cold vacuous pipe, because there is no air to cushion the blow, but even air will not ordinarily eliminate its destructive force. The main remedy is slow admission until all pipes are brought to the same temperature.

ROUNDABOUT SUPPLY LINES TO RADIATORS.

Some of these practices as outlined resulted in this instance in radiating surfaces being supplied by steam in roundabout or indirect ways. In many instances duplicate lines were found paralleling one another. Some of these were occasioned by the installation of additional radiation which could not be supplied from the nearest pipe as this might already be overloaded, and consequently the run was made to some farther point. Steam mains were sometimes given a pitch which caused them to drain back against the flow of steam. That the supply pipes were undersize may best be evidenced by the fact that the buildings could be heated successfully only when the outside temperature was above 20° F.

BREAKING OLD PIPE IN MAKING NEW CONNECTIONS.

Due to the age of the old piping, particularly in the returns under the floors, it was frequently broken in making new connections. Small leaks which were about the size of a pinhole were found at various points. Some of the pipes were removed but no instances were noted where the pipe had decreased in area, due to scale or other foreign matter adhering to the inside of the pipe. The piping, however, was badly corroded, and worn mainly on the inside but this only served to increase its available area.

Only one instance occurred of a radiator which leaked directly through its cast-iron surface. A hammer was applied to some of the radiators and the base inside them cleaned out. It is also necessary that the radiators be maintained practically level or given a slight slope towards the return end. Many radiators were found to be otherwise where they rested on the floor which had settled. A portion of the wall radiators, though hung parallel to the floor, were not true to the horizontal as the building was out of plumb, as previously stated. All radiators whose supply valves were not readily accessible to the occupant of the rooms were turned end for end.

RAISING OF RADIATORS TO FORCE OUT CONDENSATION.

Radiators had been raised from the floor in some cases, doubtless with a view to forcing the water of condensation through the pockets which existed in the return piping by creating a static head due to the elevation of the radiator. While this method might force the water through such pockets it would cause the air to be passed through these water seals. The intentions were good but this practice resulted in the lifting of the return line to which the radiators were connected, thus forming more high and low points than before.

It was thought that the swing check in an impulse valve would hang open and pass steam on any radiator which was inclined towards the return end. These valves, however, were usually installed level regardless of the pitch of the radiator itself. It also takes quite an inclination to maintain these swing checks in an open position. If this condition were true it could be offset by turning the interior of the impulse valve with its check through an angle of 180°, without affecting the operation of the valve, though this would be but a makeshift.

TROUBLES FROM PIPE SCALE.

Troubles arising from pipe scale were increased at some points by the use of galvanized pipe, the galvanizing soon cracking off the interior of the pipe and settled at valves, etc.

Many of the fittings were of malleable iron. These are not as quickly broken as cast-iron fittings, also when tightened up they start to leak. Owing to a peculiar shrinkage in all malleable castings, slightly porous places exist and these will show slight leakage when water or steam pressure is put on. They will, however, rapidly rust up and cause no trouble, and in no way does this affect the strength of the fitting. It is impossible to produce malleable fittings absolutely free from some slight leakage, and where this is an important factor, galvanized fittings may be procured and the trouble avoided. The amount of scale which could accumulate from galvanized fittings alone is negligible.

IMPROPER INSTALLATION OF GLOBE VALVES.

Globe valves had been used throughout the system in the steam and return lines. These were installed with the valve stem vertical, in which position they held back the condensation and collected pipe scale. Globe valves must be turned on their sides with the stem horizontal to avoid this condition, which is not desirable as the water then gets into the stuffing box and packing. Gate valves should be used on this class of work. The only objection to gate valves

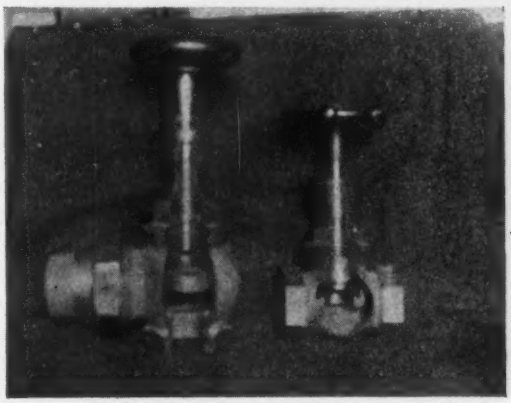


FIG. 1.—SHOWING DIAPHRAGM IN GLOBE VALVE OF STRAIGHT-WAY TYPE, WHICH DOES NOT OCCUR IN GLOBE VALVE OF ANGLE TYPE, AS SHOWN AT LEFT.

is that when these valves start to leak, they are very difficult to repair, while with the globe valve a new disc can be installed with very little trouble. The accompanying cut shows the web or diaphragm which is present in the globe valve of the straight-way type, but which does not occur in a globe valve of the angle type as shown at the left side of this cut. (Fig. 1).

Another point, though probably not important in low pressure piping, is that globe valves should be set to close against the pressure. When set to close with the pressure, should the disc become detached from the wheel, the valve could not be opened as the pressure of the steam would hold the disc to its seat. An arrow which indicates the proper position in which the valve should be installed in relation to the flow of steam through it, may be usually found

on globe valves, sometimes on both sides of the valve.

LEAKS IN VALVE BONNETS.

Leaks often occurred in the bonnets of valves at the radiators. These were very annoying as they did not remain as corrected. This was due to valve stems which had become bent or twisted. When the valves were operated the bent stems would work the packing loose. Formerly any return which was pocketed would freeze up if the radiator to which it was connected had its supply valve shut off, as at the close of working hours when the men left the offices. Evidently the steamfitters objected to the amount of attention which they were called upon to give these frozen lines and had applied a wrench to the valve stems in order to lock the valves in an open position, and thus keep the steam flowing through the radiators at all times. In this way the valve stems were bent. Another scheme which was worked by the steamfitter was to remove the discs from the globe valves at radiators. The writer has noted with amusement the apparent satisfaction which some of the tenants of the offices derived from operating these valves, being perfectly oblivious to the fact that the disc had been removed.

The supply and return branches to the radiators in offices at the north section were in an exceptionally poor condition, in the way of numerous pockets, uncovered pipes, etc. It would have taken considerable time to place this piping in good condition. Therefore, all of this portion of the system was removed and replaced by mains of larger size, thus eliminating the former method of supplying the radiators in roundabout ways. A differential valve was installed controlling this section as a separate unit.

TROUBLES FOUND AFTER VACUUM HEATING SYSTEM WAS INSTALLED.

After the system had been changed to operate as a vacuum return system a number of further troubles developed, which were not the fault of the new system itself, but due rather to incorrect methods of piping.

A 4-in. line carrying steam at 50 lbs. pressure extended from the boiler house to the yard. A connection had been taken off of this main and a line run to the radiators in the building nearest the boiler house. The returns from these radiators were connected into the returns of the vacuum system. This occurred at a vital point in the system, as all other returns are beyond this point, and being the farthest from the pump the flow through them was greatly retarded. As the differential valves operate on a difference in pressure, it may be readily seen that those which were nearest the pump would open and pass steam continuously on account of the high pressure back of them, thus destroying the vacuum in the main return and causing the whole plant to operate unsatisfactorily. The radiators in this building were finally connected to the low pressure supply main and the trouble avoided.

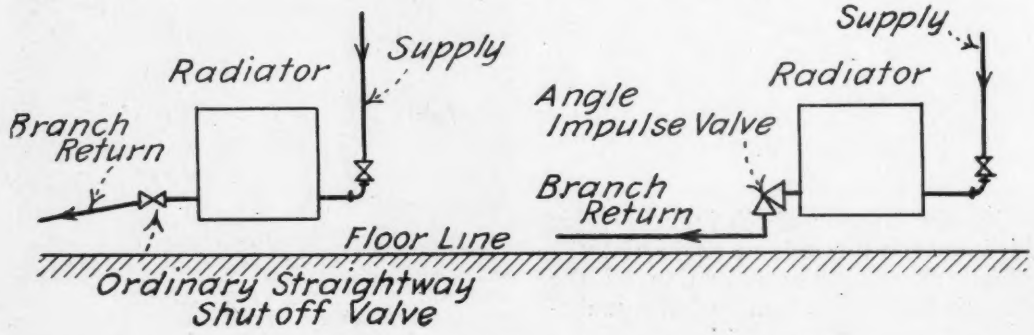


FIG. 2—CONDITIONS IN OLD SYSTEM AND AS CHANGED IN NEW SYSTEM.

A number of low points were formed in the old return piping by the installation of impulse valves of the angle type at radiators. The available pitch for the returns above the floor was limited to a few inches. Had the return from a radiator or coil been started with an impulse valve of the straight-way type there would have been available more of the headroom which existed between the

return connection of the radiator and the floor. The following sketches will make this point clearer. The sketch at the left shows the conditions as they existed in the old system, and one at the right the conditions as existing after the system had been changed over. (Fig. 2).

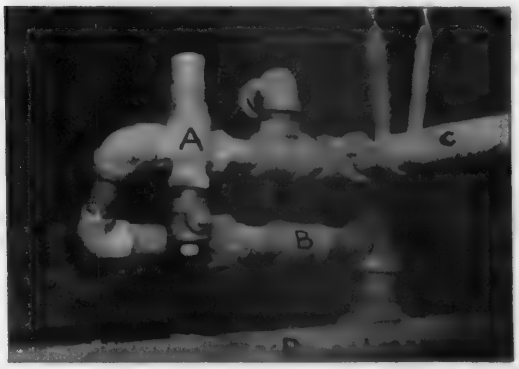
The contents of a strainer at the pumps was removed. There were a few pebbles and a large cinder in this deposit which had collected during a period of two months. Strainers should be cleaned more frequently, however. The deposit was formed chiefly by the combination of oil with the rust in the pipes and resembled a sort of putty or red lead.

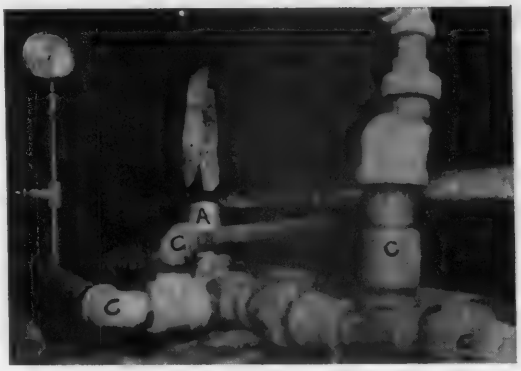
TROUBLES DUE TO PRESENCE OF OIL AND RUST.

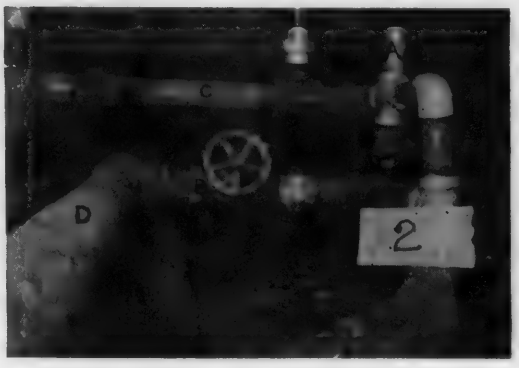
The returns were at first wasted to the sewer on account of the presence of oil in the system, and this would have constituted a decided loss had it been necessary to continue this process. Considerable lubrication is used at the compressor, as the locomotive boilers, when forced, supply wet steam to the same. The oil separator is close to the compressor and its discharge is trapped. Exhaust steam for the feed water heater is taken off at right angles from the main, and this seems to prevent the oil from being carried into the heater. A frequent trouble with oil separators is imperfect drainage, or in the use of an oil which is too volatile, thus allowing some to go through the separator without striking the baffles at all. The baffles should be frequently cleaned, and the efficiency of the oil separator should then be from 95 to 99% elimination of the total quantity of oil used.

The troubles arising from the mixture of oil and rust continued throughout the first heating season. This system was formerly supplied by live steam only. When exhaust steam was used for heating, as is usual with vacuum systems, the oil in the steam loosened up the scale which adhered to the pipes. Instances can be recalled where boilers have become leaky and crown sheets overheated from loosening scale whenever an open feed water heater was installed. The exhaust steam used in these heaters contains oil which does not harm the boilers by causing the leaks directly, but indirectly by loosening the scale over these leaky spots.

The troubles from scale in old installations are an annoyance at first, but this also occurs in any new heating system until the piping has been entirely flushed out.







FIGS. 3-5—TYPICAL EXAMPLES OF IMPROPER METHODS OF PIPING.
A—Differential Valve.
B—Globe Valve.
C—Branch Return.
D—Main Return.

TYPICAL CASES OF IMPROPER AND PROPER METHODS OF PIPING.

The following photographs (Figs. 3-5) are submitted as typical examples of improper methods of piping which occurred mainly at the differential valves. The branches shown formerly connected directly into the main return. These former connections are shown in one of the sketches and are labelled old tees. A vacuum of 10 in. is carried on the main return and, according to the usual practice with the type of system here installed, it was necessary that differential valves should be connected to the main return at various points in order to receive the discharge from the branch returns and regulate the flow through each.

FIGS. 6-11—EXAMPLES OF BETTER METHODS OF PIPING.

A—Differential Valve.
B—Globe Valve.
C—Branch Return.
D—Main Return.

Some better methods of piping are shown in the following photographs. Note the conditions existing under the the floor and the few feet of headroom. (Figs. 6-11).

The use of so many fittings in connecting the branch returns to the main return is undesirable as they unnecessarily impede a free flow, increasing the liability of leaks, also increasing the maintenance; in other words they have the inherent potentiality of trouble.

Some of the connections which are not shown in these photographs were particularly bad. In one instance a return rose in order to connect to the top of an old tee which happened to be convenient, in the main return. This tee might have been turned to allow its

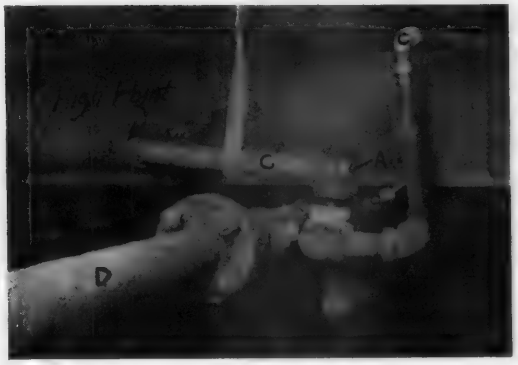


FIG. 12—HIGH POINT IN RETURN CAUSED BY TOO SHORT HANGER.

branch connection to lie in a horizontal plane, thus making possible a greater drop for the branch return in connecting to this tee.

A fair portion of the low points in the return piping could have been avoided by the use of shorter lengths of pipe, shorter nipples, or by turning a tee or fitting on its side when making a connection thereto. Some of these returns had a grade in the opposite direction to the flow of condensation through them. The photograph (Fig. 12) shows the high point which existed in one of these returns caused by the hanger supporting this pipe being too short in length.

The branches should connect direct to the main and not parallel the same for some distance before connecting to it. The branch returns cannot strictly comply with this unless there is a differential installed for each, otherwise a number of branches must be connected together and run to one valve. One of the sketches (Fig. 13) illustrates how one of these long runs parallel to the main was finally avoided by installing another differential valve. This also divided one large unit controlled by one valve, into two smaller units each controlled by a differential valve, thereby affecting better control over each, and distributing the work involved. The cost for two valves of smaller size is about the same as for the one valve of larger size.

(To be continued.)

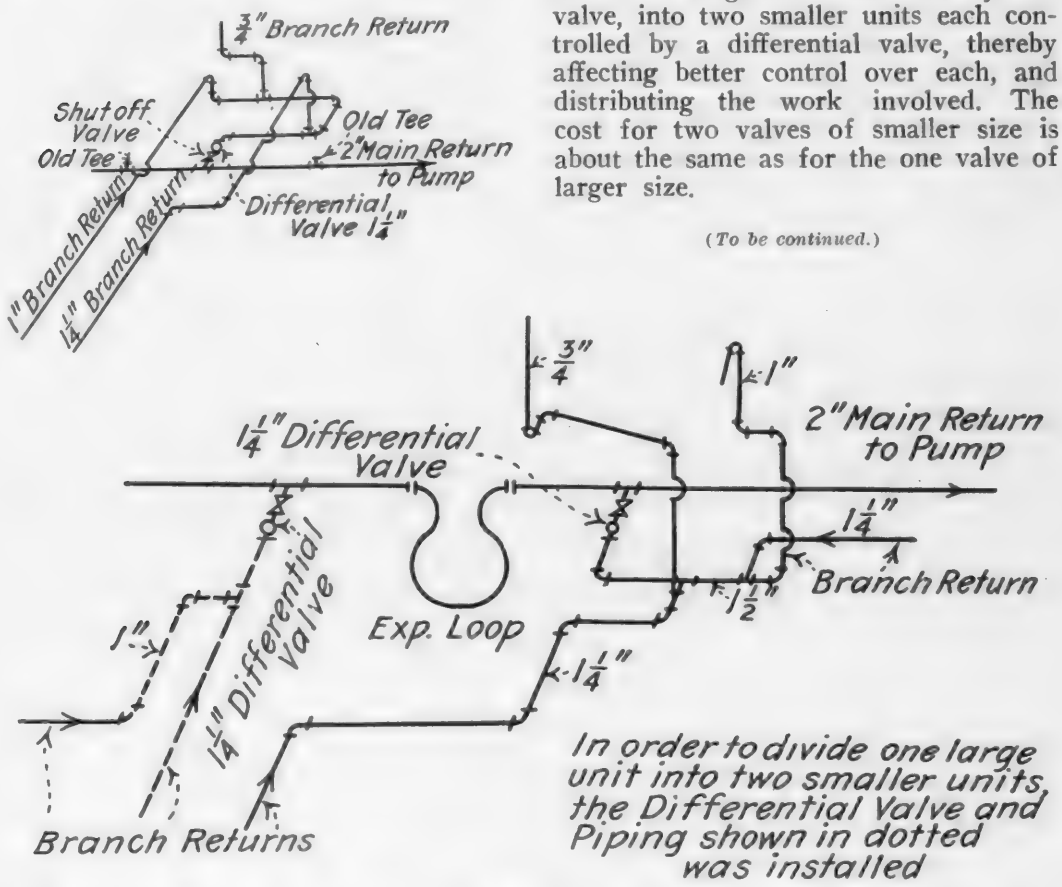


FIG. 13—METHOD OF DIVIDING ONE LONG RUN INTO TWO SMALLER RUNS BY USE OF DIFFERENTIAL VALVE.

Reduction or Elimination of Noise Attending the Operation of Mechanical Ventilating Machinery

(Presented at the mid-summer meeting of the American Society of Heating and Ventilating Engineers, Cleveland, O., July 9-11, 1914).

By R. W. Pryor, Jr.

As there does not seem to be any law which could be laid down to govern oneself on the installation of ventilating machinery, I will endeavor to illustrate some different phases of the subject with the remedies used to correct the trouble. Below are given some experiences:

A 60-in. steel plate fan, with overhung blast wheel, was operating in a concreted basement. This basement was walled-in in a substantial manner, and entering into this basement where the fan was located, were some conduits. The fan was operating at a pressure of something over 1 oz. and there was no perceptible noise immediately in the vicinity of the fan. However, about a half a block away there was a decided rumble, which was traced to the operation of this fan. The fan was covered with 6 in. of hair felt. This helped to deaden the sound somewhat, but did not entirely correct it. It seemed as though the fan or something started a vibration of the air in this chamber, the sound of which was projected or carried through the conduit tubes to the location where the sound became audible. I believe this is one of the most elusive problems the engineer has to contend with.

Another instance was the case of two 24-in. motor-driven propeller wheels, which were located in the rear of a counting room of a bank, discharging the air into a brick areaway. These fans made a howling noise, which might be termed windage. Due to the air rushing through the blades, the fact that they discharged into this brick areaway, aggravated the condition. These propeller wheels were changed to flat blade type, the speeds being approximately the same in either case, but the amount of air handled by the flat blade wheel is about 75% of that handled by the curved blade. The result was, that the improvement was very noticeable and the noise practically eliminated. The speed of the first fan, and the velocity of the air through it, was too great for the size of the areaway and the sound was the result of vibrations due to the high velocity in a confined space.

OVERCOME OBJECTIONABLE HUM OF APPARATUS.

In a certain building consisting of a hall approximately 48x54x17 ft. high, with an open attic space above, there was located a 36-in. disc wheel with direct-connected single-phase motor running at 600 r.p.m. This fan had no immediate connection with any duct work, being mounted on a special steel support held firmly in the brick wall. This fan drawing on the attic space, effected its ventilation of the hall through openings leading from the hall into the attic space. The hum from this outfit was so objectionable that the apparatus could not be used. The location of this outfit was subsequently changed so that it did not pull its air through quite so great a distance, thereby changing the proportion of the cubical contents through which it was drawing to the volume of air handled. The outfit was supported in a similar manner as before, and to one of the same brick walls; the same material being used as far as possible to make the change, and the fan running in the new location gives the desired ventilation without the noise which was so objectionable. This seems to bear out the theory that we have to consider the question of sound produced by the vibration of the air independent of the sound produced by the friction of the air against the walls of the duct. I think this condition is further exemplified by the fact that sound travels approximately 61,000 ft. a minute, which on ventilating systems, such as we have been considering, gives the velocity of sound anywhere from 60 to 100 times greater than that at which the air is traveling.

This resonator effect is one that there does not seem to be any way of anticipating or pre-determining, making it necessary to resort to a "cut and try" process.

there would be no metallic connection to conduct vibration, if the fan should produce any,—and on the outlet side of these fans, where they discharged into a brick flue, they were provided with a galvan-

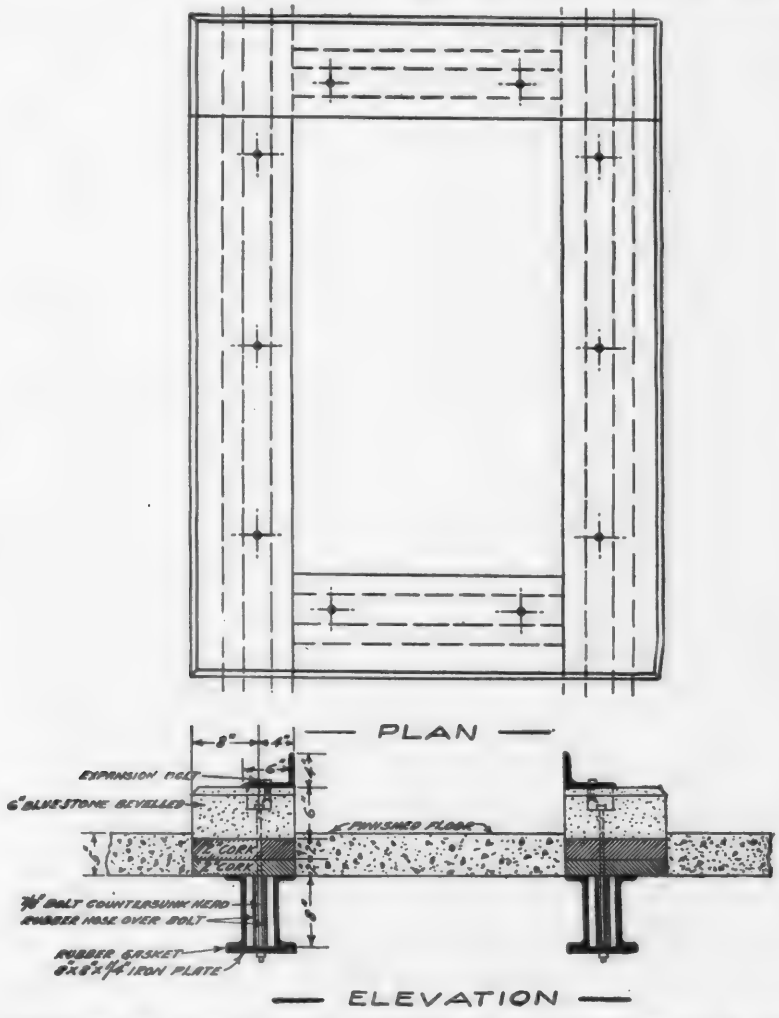


FIG. 1—FOUNDATION DESIGN FOR DOUBLE 120-IN. CONOIDAL FAN, LOCATED ON THIRD FLOOR OF HOTEL.

FULL-HOUSED FANS REPLACE PROPELLER FANS.

Before leaving this part of the subject, I want to cite one more instance where there was an installation, for ventilating an auditorium, of two 30-inch propeller wheels with direct connected one horsepower motors, 600 r.p.m. direct current; the outfits being installed in the duct work, and bolted to a brick wall by means of lag screws and ½ in. rubber washers. The ducts were provided with flexible canvas connections 8 in. long, so that

ized iron sweep to turn the air without shock. These wheels were so noisy that it was impossible to run them over 400 r.p.m., at which speed they did not give enough air to properly ventilate the room in question. The noise at 600 r.p.m. was about like a planing mill exhauster running at 3 oz. pressure. Those of you who are familiar with this class of work, will appreciate what such a noise would amount to. After trying several remedies, the fans were pulled out, and there were installed in their place two 80-in.

full housed fans, each belted to one horse power motors; the fans running at about 170 r.p.m. The same duct work throughout was used, and the volume of air delivered was slightly increased. The trouble was absolutely corrected. These new fans were placed slightly nearer to the auditorium than were the propeller wheels; but the motors were placed outside of the duct work; so, the combination which originally produced this noise was completely changed.

I cite another case on some small volume exhausters which were running at 1,200 r.p.m. with direct connected motors, and for which we substituted 40-in. steel plate belted fans at 480 r.p.m. In this case more air was handled than before with complete elimination of noise.

In these various illustrations, I would say that the disturbance in each case was caused by air vibrations rather than any mechanical defect. Mechanically these various outfits were above criticism.

There are some factors which are important, viz.: the number of turns or the revolutions of the fan wheel; and whether the motor is in the air travel or not. The swish or rushing noise due to the air passing through duct work at high velocities and being deflected around elbows.

Some motors more than others produce a magnetic hum, and if the motor is in the air current, this may prove objectionable. The spokes of a fan wheel turning up at a rapid rate, interfering as it does with the air current, gives a rushing sound to the air.

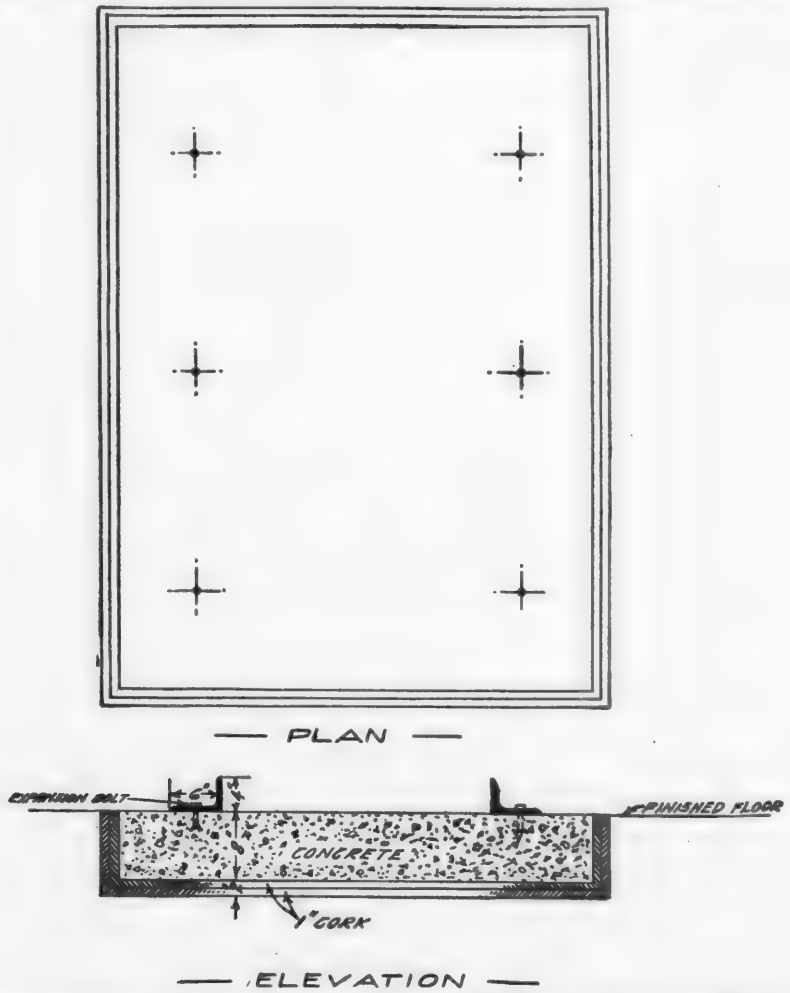


FIG. 2—SETTING FOR FANS LOCATED ON UPPER FLOORS OF BUILDINGS.

METHODS OF DEADENING UNITS.

Methods of insulating and deadening units are of importance, and on small di-

rect-connected ventilating sets, I have used with success a cast-iron unit bedplate containing the fan and motor. This bedplate being approximately 2 in. high and having sufficient weight in it to hold the outfit firmly without bolting. This bedplate is then mounted on about 2 in. of hair felt.

Appended hereto is a sketch (Fig 1), of foundation design which was used on a double 120-in. Conoidal fan in a New York hotel—the fan being located on the third floor of the building. This has given good satisfaction and is, to my mind, a good foundation.

Another form of setting for fans located on the upper floors of buildings, is to place the fan on an 8-inch monolith of concrete completely surrounding the concrete with 2 in. of cork, bottom and sides (Fig. 2). This gives considerable weight to base in the 8-in. monolith and absorbs any vibration, and the cork acts as the insulator.

NOISE FROM THRUST COLLARS.

The question of noise from thrust collars is one which very often causes trouble. The thrust collars on the fan shaft should be smoothly turned and should work against babbitted shoulders on the ends of the bearings. In some cases not enough attention is paid to this, with the result that there is a thumping noise, due to the unevenness either on the collar or the end of the bearing, particularly if the fan is a belted one and there is some inequally in the alignment of the belt.

WHY DUCTS ARE NOISY.

The duct work is sometimes noisy due to the air traveling through it at considerable velocity, especially if the duct work has not been properly braced. Furthermore, at high velocities it has been necessary to increase the resistance of duct work at elbows, due to the fact that the elbows furnished, while being theoretically and practically good elbows for the conveying of air, were of such angle as to deflect the air, creating a slap on the opposite side. In some cases good elbows, have, of necessity, had to be spoiled in order to correct this, and I am informed that some of the engineers have used 1-in. hair felt covered with canvas on the inside of the ducts at places such as these, to absorb the noises produced by the reflection of the air—and where these corrections have been made, it has been necessary to increase the speed of the fan in order to put up additional pressure to overcome the resistance.

Data for Testing Air Washers

A STANDARD METHOD PROPOSED BY A COMMITTEE OF THE AMERICAN SOCIETY OF HEATING AND VENTILATING ENGINEERS.

In preparing a code for a standard method of testing air washers, the committee recognized the many difficulties to be encountered, and the large amount of research work necessary. From a review of the work which had been done along these lines, the methods and procedure would naturally arrange themselves in three general groups:

1. Dry filters.
2. Soluble filters.
3. Direct dust count.

The dry filter method was the first used and has gone through several stages of development.

1. The plain cloth screen through which all the air passed.

2. The filter paper method through which passed only a small percentage of the air.

3. A screen made of cloth having a heavy nap.

4. A fine mesh wire screen.

5. The Carrier method.

PLAIN CLOTH SCREENS.

The plain cloth screens were built of cheese or bolting cloth, mounted on light frames and arranged so that all the air passing through the air washers would pass through the cloth. One set was mounted directly after the eliminator plates, and a known amount of testing material was introduced into the inlet of the washer in a specified time. The percentage by weight of the amount deposited on the cloth to the amount introduced was considered as the washing efficiency of the air washer. The method was later varied by making tests at each end of the washer and not using any spe-

cial testing material. In this method many inaccuracies from many sources were apt to be introduced.

1. A great number of fine dust particles passed through the screen. This can be readily understood when we recall that ten million dust particles per cubic foot of air is not uncommon, and that one of Dr. Hill's tests made in the middle of Lake Michigan showed 646,000 dust particles per cubic foot. A cloth with mesh fine enough to remove these would be impractical, if not impossible.

2. The accuracy of weighing the cloth before and after being exposed gave very unsatisfactory results. The common method was to weigh the cloth before the test, after it had been subjected to a high temperature for a specified length of time. This was again done after the cloth had been exposed to the air to be tested. The accuracy of the results depended largely upon the precision with which the weighing was done.

It is very difficult in varying atmospheric conditions to weigh cloth with extreme accuracy. This is due to the fact that all fabrics have a natural moisture content corresponding to the temperature and relative humidity. As soon as the screen is removed from the oven it starts to absorb moisture to its natural amount and during this time the weight is constantly changing. The atmospheric conditions before and after the test would hardly be the same, so an error due to the different amount of moisture would be introduced. Another trouble experienced is in protecting the screens from outside influences, such as dust being deposited before and after the test is run and dust being shaken from the surfaces during the baking.

Another inaccuracy in weighing, when no special testing material is used, is due to the loss of weight of the foreign matter itself, as a result of its subjection to a high temperature. The smaller the deposit on the screen, the greater the percentage error would be. This would not be so noticeable should testing material be used, but then other difficulties would be met, such as obtaining an even distribution over the face of the washer and keeping the particles divided, which otherwise, from their own weight would fall to the bottom of the washer. The popularity of this method is due to the simplicity of the apparatus and the natural adaptation of the filter screens which air washers replaced.

In order to overcome to a large extent many of the above mentioned difficulties, this method was refined. Large filter papers, mounted in a funnel, were attached to the suction side of a gas meter. Measured amounts of air were drawn through the filter, and the amount of dust deposited determined by weight. The same error given above, such as weighing foreign dust, etc., were encountered to a smaller extent. Samples were taken at each end of the washer, but no effort was made to get an average air sample over the face of the washer.

A SCREEN MADE OF CLOTH WITH A HEAVY NAP.

Another variation of the cloth screen method was the substitution of a cloth with a nap for the cheese or bolting cloth. This gave a larger surface, in proportion to the area, for the dust to adhere to and no doubt cut down the amount passing through the screen.

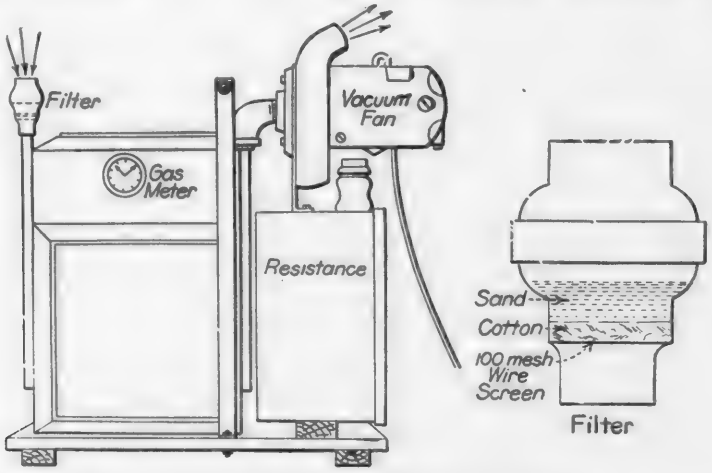
A WIRE SCREEN.

One trouble experienced with the screen method was in cutting down the air supply. This was caused from the extra resistance to the flow of air. In some instances this could be overcome by varying the speed of the fan. To simplify accurate weighing, wire screen of very fine mesh was substituted for cloth. In this way errors resulting from natural moisture regain were eliminated; however a larger number of dust particles passed through the wire screen, so that the advantage of accurate weighing was more than offset by this greater error.

THE CARRIER DRY EILTER.

The Carrier dry filter consists of two cloth filter bags of small size, through which the air is drawn simultaneously from the front and the back of the washer at an equal and constant rate. This is accomplished by maintaining a constant pressure drop through an orifice in the diaphragm. The pressure difference on this orifice is maintained automatically by means of a throttle valve,

controlled electrically through a float in pressure gauge. The entire apparatus is mounted on a subbase 3 ft. long and 17 in. wide. The air is taken into each filter bag through a sampling tube, which has openings distributed as uniformly as possible over the faces of the washer. At the point of entrance to the sampling tube, there is an electric heater, so that the air is thoroughly dried out before passing into the bags. This is done in order that any moisture in the dust or air will not cause deposits on the tubing or choke up the filter bag. This apparatus is very complete and convenient to use, inasmuch as it is self-contained. At the time of writing no tests had been made with it. A great advantage of this machine is the possibility of taking samples of air from both sides of the washer simultaneously.



TYPE OF FILTER SOLUBLE IN WATER.

FILTERS SOLUBLE IN WATER.

The second general group is composed of filters soluble in water. The only one of this type is briefly described by Dr. Hill in his paper, "Report of Ventilation Division, Chicago Health Department," as follows: The sugar filter apparatus consists of a gas meter through which the air is drawn by means of a high pressure centrifugal fan. On the inlet of the meter is situated the filter, which consists of a glass receptacle containing 25 grains of sugar on a No. 100 mesh wire gauge. From 10 to 50 cub. ft. of air are drawn through the sugar, which is then dissolved in 100 c.c. of distilled water, and the dust particles counted in a Sedgwick-Rafter counting cell, with a ruled eye piece. From the engineer's standpoint this method would never be practical, inasmuch as for accurate results, the services of a chemist are needed. Other substances for the filter besides sugar are used in this type of machine.

DUST DETERMINATION BY DIRECT DUST COUNT.

Under group III, dust determination by direct dust count, there is only one method which has been tested and proven satisfactory. This is by the Aitken dust counter. Professor Aitken developed this apparatus from his Koniscope, the accuracy of the results depending largely upon the skill of the operator. The air to be tested is drawn into a chamber and expanded adiabatically, thus obtaining saturation. The dust particles in a saturated atmosphere form a cloud or fog, the density of which is compared with standard cards, on which are marked ed the corresponding number of dust particles per cubic foot. This method leaves much to be desired, as so much depends on the personal element, and there is no way of obtaining a permanent record.

The Aitken dust counter overcomes the difficulties of the Koniscope by introducing a low power microscope with a ruled object glass. The dust particles falling on this can be easily seen and counted. Briefly, the Aitken dust counter consists of a cotton filter through which air can be drawn to scour the testing chamber.

Three way cocks are inserted in the line between the filter and the chamber. These are so arranged as to make possible different dilutions of the air to be tested with the filtered air. The cubical content of the expansion chamber is exactly 50 cubic centimeters and contained in the chamber there is a fibre member for supplying the necessary moisture to saturate the air. Mounted inside this chamber is a small arm for stirring the air so as to obtain a thorough mixture of the test air and the filtered air to accelerate saturation. Between the lens and the ruled object glass, which is situated in the bottom, there is exactly one cubic centimeter; therefore the dust deposited on the object glass is from one cubic centimeter. A displacement pump is connected to one side of the expansion chamber.

In operating, the pump draws the air through a filter for scouring out the expansion chamber; afterwards the air for testing is drawn into the chamber, and the air cock closed. Then the pump is again actuated so as to remove the air from the expansion chamber and draw in the air to be tested. This air is expanded adiabatically by further movements of the pump. The mixing rod in the chamber is agitated before these final movements of the pump. As soon as the air becomes saturated, the dust particles fall upon the object glass, and can be counted through the eye piece. In order to obtain a permanent record, Mr. Hoskins suggested that a small piece of smoked glass, the diameter of the object glass, be introduced into the chamber. The dust particles, in falling upon this, produce minute dots in the carbon. The glass is then removed and mounted for counting on a regular microscope slide. In this manner, a permanent record is made of the results. As far as is known now, the Aitken dust counter gives extremely accurate results, although questions have arisen as to the probability of certain gases causing precipitation on the object glass in a saturated atmosphere. As yet this has not been proven.

Dr. Hill is developing a Diffractoscope which consists of a cylinder having a slot on one side through which enters a beam of light, and at one end an eye piece through which observations can be made. The object of this apparatus is to determine the number of dust particles in the air when it is "optically empty," and to use this as a standard for pure air. Filtered air will be drawn into the chamber until it is optically empty, that is until no dust particles are visible in the beam of light, then by means of the Aitken dust counter, the dust particles remaining will be determined.

Another method, which has not as yet been experimented with, consists of a high grade camera, having high speed shutters and microscopic lenses. With a standard ray of light, photographs can be made directly in the air chamber. This apparatus will give a permanent record of the dust count, and in all probability with standard lens and standard beam of light, dust counts can be made with the same degree of accuracy.

DATA TO BE OBTAINED FROM TESTS.

In determining a procedure to follow in our testing, it was found necessary to consider the following:

1. How many hours after a heavy rain that a test should be run?

A heavy rain acts as an air washer and removes from the air all but traces of dust. This has been proven conclusively by daily readings taken on the roof of the Chicago City Hall. As the dust remaining in the air would be, necessarily, very difficult to remove, an air washer tested under these conditions would be at a great disadvantage, and would not show a true average result of the washing efficiency.

2. Would it be desirable from the standpoint of the engineer to have two washing efficiency guarantees; one covering the removal of dust which has an affinity for water, and the other the removal of particles of carbon and oil?

Under the first head would come dust from the streets, which is composed of vegetable matter, dust from the pavements, particles of hair, etc. It may be possible to find a method to differentiate between these two kinds of dust.

3. Would it be desirable to test all washers with some standard material?

A great many questions rise in connection with this, such as percentage of foreign material to the pounds of air passing through the washer, the method of

introducing the material into the air, and also the nature of the material.

4. What correction should be made in the washing guarantees for variation in temperature and relative humidity?

Experiments no doubt will prove a wide variation of washing efficiency, when operating under different temperatures and relative humidities. This variation will no doubt be due to the ease of removing dust which has an affinity for water when the air is near the saturation point, as a great amount of this would be precipitated from its own weight.

5. Does the temperature of the spray water in relation to the wet bulb temperature of the entering air have any effect on the washing efficiency?

We might expect when any dehumidifying is done to find 100 per cent. washing efficiency, in case the elimination of free moisture is perfect. The effect on the washing efficiency of heating spray water is not known, and will have to be investigated.

6. What procedure should be followed in finding the efficiency of a washer for bacteria removal.

This point is of great importance, as people are becoming educated in regard to bacteria in their homes, schools, churches, theaters and manufacturing places. As the work progresses, other questions of equal importance will present themselves.

EXPERIMENTAL APPARATUS AND PROCEDURE.

In order to do the research work necessary to obtain the data for a basis on which to formulate recommendations for a standard method of testing air washers, your committee considered it necessary to have an experimental plant so that all the variables could be controlled. The Carrier Air Conditioning Company placed at their disposal one of its type "H" air washers and humidifiers, connected to a Buffalo Niagara conoidal fan. The fan and recirculating pump are driven by General Electric motors. In connection with the Carrier air washer, there is furnished two sets of eliminator plates of different types, one having a device for flooding the surfaces and six corrugations, and the other without a flooding device and with four corrugations. There are also two sets of spray nozzles of different sizes. This apparatus has been installed in a pent house on the roof of the Chicago City Hall Building.

The first tests will be run under as nearly constant conditions as possible to determine the comparative accuracies of the different methods of dust determination. After this has been established, tests will be run varying one atmospheric condition at a time, so that its effect can be studied. Later different types of dust will be introduced and their effect on the washing efficiency noted. Tests will be run with different temperatures of the spray water, which can be held constant by a Carrier automatic dew point control. Bacteria plates will be taken in connection with the foregoing, both in the air and the recirculating water. From chemical analysis of the recirculating water, data on the composition of the dust particles will be obtained.

The committee is attemptitng to collect complete and accurate data to establish the laws governing the efficiency of air washers, and with these as a foundation, recommendations for a standard method of testing can be formulated and submitted for your approval. Data obtained from these tests will be reported at the winter meeting.

DISCUSSION.

MR. W. G. R. BRAEMER: Air cleansing guarantees in connection with air washers, as at present made by different manufacturers, are subject to criticism, to say the least. Our company has for a number of years past conducted numerous tests in our experimental laboratory for the purpose of determining upon the best method of testing air washers, but each and every one so far has proven unsatisfactory in one way or another. We have in many cases endeavored to ascertain the cleansing efficiency by weighing a cheesecloth screen, subjected to the air before and after leaving the air washer, and this test is, in the writer's opinion, an utter failure, since the amount of dirt collected on the screen in the air leaving the air washer is so small as to make practically no difference in the weight, but such difference as exists would appear due to the avid-

ity of the cheesecloth for the moisture absorption.

Sometimes the above tests were conducted for a period of several hours without adding any dirt to the air in passing artificially; at other times we have taken a flour sifter, holding two quarts of flue dust, and passed it through the air washer, but with the same result in both cases. We have used dry cheesecloth screens, several screens being placed in succession in front of the air washer and, of course, fine dust particles would pass through the screens. At the same time if very much passes through there is no doubt that the screen will be discolored, and the screens thus placed would give a fair indication of the air cleansing efficiency of the washer as compared with the similar screen placed in front of the washer. At other times we have placed a blacksmith forge in front of the air washer, built a heavy soft coal fire, placed oily waste on the fire. A cheesecloth screen located beyond the eliminator of the air washer, would indicate by discoloration the amount of carbon or dirt passing through and a person standing in front of the eliminators would get a fair idea as to the removal of the gases.

THE WEBSTER METHOD: Another method we have pursued in many cases and which seems so far the most satisfactory as an ocular demonstration, we have called the Webster method. This consists of the placing of one or more small screens in the path of the air before and after leaving the washer. These cheesecloth screens are given a coat of vaseline, with the object of making the dirt adhere to the screens and in such cases it is found after a day's run that the screens in the fresh air inlet are absolutely coal black, whereas the screens in the air leaving the air washer are in some cases entirely clean and in others slightly discolored. Of course such a test gives no accurate method of establishing the efficiency of the air washer, but it indicates, nevertheless, in a very satisfactory way, whether the air washer is doing good work or not. This test, of course, is only satisfactory under natural conditions.

From our experiments as well as our actual experience in many and varied installations, we have found a difference in the air cleansing efficiency with a given air washer for different temperature and humidity conditions. For instance, we have found when the water used in the air washer under natural conditions is very cold the air cleansing efficiency is not as good as when the water is of a higher temperature and this is accounted for by the low wet-bulb temperature of the entering air and consequent low relative humidity of both air entering and leaving. In some instances the writer has advised making provision for warming the water slightly in order to increase the air cleansing efficiency of the washer.

The subject is a very broad one since a great many variables enters into the question, but it seems to the writer that any standard method of testing air washers for air cleansing efficiency should be made with a view toward simplicity. Not only should a standard method be established, but a standard condition, and this condition should be the worst one found after a series of tests.

In the report by the committee, under the heading of "Data to be obtained from tests," it is stated: How many hours after a heavy rain should a test be run? This naturally would be assuming that the test should be run without passing artificially any dirt through the washer, but under natural conditions. Whether it has recently rained or not, would have little or no influence on an air washer test conducted by introducing dirt artificially into an air passage.

2. Whether or not it will be desirable from the standpoint of the engineer to have two washing efficiency guarantees, one covering removal of dust which has affinity for water and the other the removal of carbon and oil. I would say that if an air washer will remove a certain satisfactory percentage of carbon or oil it is sure to remove practically all matter with affinity for water, so that if a series of tests were conducted covering relative efficiency of the air washers for removal of both matter with affinity for water as well as carbon, etc., a standard guarantee with reference to one could be adopted which would cover both.

3. Whether or not it will be desirable to test the air washer with standard material, the writer would say, positively yes; at the present time tests with different air washers are conducted with different materials, some use road dust, others wood ashes, others lamp black, etc. We have for several years past used flue dust removed from our smoke stack at our factory where we burn soft coal in the boilers and we believe this material representative for the purpose. It probably would be a difficult matter to find a standard material which would be within the reach of everybody, yet such a thing might no doubt be done.

4. What correction should be made in the washing guarantees for variation in temperature and relative humidity? In this connection would say that it does not seem to the writer that such corrections should be necessary, since our experience indicates that the air cleansing efficiency remains reasonably constant for a fair range in temperature and humidity and it is only when the outside wet-bulb temperature has been very low, with a consequent low temperature of wash water, no humidity control system being installed, that we have seen any material difference in the results, so that if air washer tests were conducted with ordinary conditions of temperature and humidity, it seems to the writer that would be sufficient.

5. Does the temperature of the spray water in relation to the wet-bulb temperature of the entering air have any effect on the washing efficiency? This seems to be substantially the same as covered by question four. When dehumidifying is done, of course conditions are different, inasmuch as in such cases the wet-bulb temperature of the air entering the washer is usually high and therefore, the air leaving the air washer is completely or practically saturated, and a high air cleansing efficiency might be expected. The sixth question, with reference to bacteria removal, is a question for scientists and not engineers to solve. Bacteriological tests in connection with air washers were made at the Springfield International Y. M. C. A. Dr. McCurdy of that institution and D. D. Kimball, who was the consulting engineer, will be able to tell us how these tests were conducted.

Summing up the above the writer would suggest :

1. That endeavors be made towards establishing a standard method of testing air washers for cleansing efficiency—after careful investigation by the committee.

2. That endeavors be made towards establishing a standard condition under which air washers should be tested for air cleansing; this condition referring to range of temperature and humidity and spray chamber velocity of, for instance, 500 ft. per minute.

3. That endeavors be made towards determining upon a standard material for testing air washers with reference to air cleansing. This material should be as near as possible that ordinarily found in outside air, such as, for instance flue dust or road dust or a combination as may be determined upon.

4. That endeavors be made towards determining upon a given quantity of standard material per pound of air handled for testing air washers for air cleansing efficiency.

The writer thinks that tests made with the experimental air washers by the committee should enable it in due time to arrive at the most desirable standards, but we must not lose sight of a fact which must be patent to any one who has studied the question, that the air cleansing efficiency of an air washer very greatly depends upon the design of the two principal factors of air washing, namely, the eliminator and the spray. An eliminator of a given type with six deflections obviously gives greater eliminating efficiency than an eliminator of the same type with only four deflections, but an eliminator with four deflections of another type might give as good or better eliminating results than the first type of eliminator mentioned with six deflections.

Experiments in our laboratory have shown us conclusively that eliminators constructed on the basis of having continuous zig zag passages for the air with small lips on the baffles are less efficient than eliminators with staggered rows of baffles. Experiments have further proven to us that it is entirely possible by

the use of staggered rows of eliminators with four deflections of proper design to get complete removal of the free moisture, to have an exceedingly low resistance to the air in passing and with a high air cleansing efficiency, so that in establishing a standard air cleansing guarantee, tests should be made with eliminators of other types in addition to those now used by the committee, and our company will be glad to place at the disposal of the committee an air washer for this purpose and we will equip this air washer with three types of eliminators. In our extensive experience in this line of business we have found that no cure-all can be found in eliminators as in anything else; eliminators must be built specifically for the purpose intended, and thus our company has three types of eliminators, depending upon the work they are to perform.

Our Society, Its Aims and Opportunities

By J. J. Blackmore.

HEATING.

The production and utilization of heat in the domestic and manufacturing arts are all within our sphere; and our activities should be extended to cover the investigation and improvement of all appliances that are manufactured or installed for the purpose of the production or the utilization of heat, excepting only those operations that are clearly within the field of the chemical, manufacturing or power developing engineer.

The work covered by the use of electricity in heating operations has received but little attention from the society and efforts should be made to bring members into it who are interested in this important branch of our industry; its use is more widely extended than is generally known.

The utilization of gas for heating purposes has not received the attention it merits from the members of this society. Yet it presents a field for investigation that is very broad and very easy of access, for almost all of the large gas producing corporations maintain laboratories that are open to the investigator.

The industry of car heating and ventilating, though a very large and important one, has received but little recognition in the efforts of the society.

VENTILATION.

The art of ventilation has even a broader field than that of heating as there is scarcely an industry in which human endeavor is engaged that could not employ the art of ventilation in some form to its advantage.

Some scientists who have closely studied the subject say that the span of life allotted to man is one hundred years and is not restricted to three score years and ten as set forth in the biblical account.

The reason for this conclusion is that most animals who live in a natural environment have a duration of life equal to five times the length of the period required to bring such animals to maturity.

Man matures in twenty years, and should live, according to the opinion of such scientists five times the length of this period, or to the age of one hundred years.

Man in seeking shelter from the elements has created artificial conditions that are not as healthful as those provided outside by nature. Industrial life or the development of the arts, has also introduced conditions that have still further interfered and prevented man from attaining his allotted span of life.

Some of our great insurance companies have tabulated the rate of mortality of those engaged in different industrial occupations by showing the percentage of the deaths per annum per thousand in each industry and these figures show that we are continually introducing occupations that are detrimental to the healthful development of the race, and unfortunately, we have not yet reached the stage in our development where the safeguarding of the health of the worker is considered as fundamental to the gaining of wealth.

The ventilating engineer has done a great deal towards improving the healthful condition of our buildings by providing means for adequately removing the vitiated air from the rooms and replacing it with pure, fresh air from the outside and he has still further demonstrated the advantage of cleaning or washing the fresh air before delivering it into the building. He has also found that the quantity of moisture in the air is a factor that affects man's condition and efficiency. That the regulation of this moisture is beneficial and the term "conditioning" is becoming a familiar word and will soon become as frequently used in the trade as the word "heating" is in its connection with ventilation.

There is still some unexplained difference between the air as delivered into our buildings and the outer air, that makes the latter more healthful. Probably the most frequently suggested remedy for ills by physicians is "keep out of doors all you can." There is a reason for this, and it is within the province of the members of this society to search for the causes of, or the reasons for this difference. The search will probably enable us to demonstrate that air can be still further conditioned to make the inside air as beneficial as the outer.

Co-operation with the physiologist and chemist and with committees of kindred societies will be necessary to enable us to go forward in this endeavor. We should welcome every opportunity for such co-operation and take full advantage of it when offered.

The society should be in touch with every university in the country that has for one of its objects a course of training in mechanical engineering. It should know of what such course of training consists and be prepared to co-operate with all such universities or their engineering departments and be interested enough to suggest from time to time, from the experience of its members, any additions to such course of training as will tend to advance the student in the knowledge of the art to which the society devotes its endeavors. The society should be fully acquainted with the equipment in the testing laboratories conducted by the national and state governments, as well as those conducted by the engineering schools and also with those maintained by manufacturing corporations.

The society through its committees, should be prepared to suggest what appliances need testing and where necessary to prescribe the manner of such tests; and when such tests have been made, they should be particularly careful that a proper report of such test or tests is made, in which the data relating thereto shall be properly tabulated in a convenient form for ready reference.

This is an age of transition and inquiry and this society should be a huge question mark and always be "in the van" where any inquiry will yield information that will lead to a better understanding in the working of the forces of nature.

No mother gives up what she knows so generously as does mother nature, but she only gives it to those who search diligently for the hidden treasures she holds in her keeping.

We must therefore be always searching earnestly for information where it may be obtained and give our best efforts in co-operation with any school or laboratory that may be interested in the investigation of the natural laws that govern the forces used in the production and utilization of heat and who are also interested in the testing of appliances and apparatus to determine their value for the purpose for which they have been produced. This is really the purpose for which this society was organized and it must continue actively and vigorously its efforts towards the attainment of its important undertaking. When the working of nature's laws are well understood, appliances will be made to utilize them to greater advantage than in the past. The best means of ascertaining how closely such appliances do work in accordance with natural laws is to test them in a laboratory, conducted by men who understand and are skilled in the working of the laws governing the operation under observation. Such a test may be, and generally is technical, but it is also practical when the manner of conducting it is clearly set forth and the results given in such a way that a practical mind can clearly understand how the results were obtained.

Tests of installations in buildings can only be made at the place in which the

installation is in operation, but so far as possible, laboratory methods should be followed, and such tests should be undertaken by men who have had laboratory training and know how to record and tabulate the results.

HEAT LOSSES.

The writer was recently asked the question, "What information has the society tabulated as to heat losses of railway cars traveling at different speeds?"

The society should at once undertake the following work and push it to a conclusion as rapidly as circumstances will permit.

The tabualtion of all data relating to heat losses through all kinds of building materials, giving the conducting power and the loss at different outside temperatures and at different wind velocities up to ninety miles per hour. These tests should also cover heat losses through all the metals and *covering materials* used in the art.

Some experiments have been made to determine such losses but the data relating to such has not yet been tabulated into a convenient form for general use.

The compilation of data covering all tests made in recent years should be undertaken at once and when data relating to such tests that have been made does not clearly state or show the conditions under which they were conducted and how the results were arrived at, such tests should be considered as doubtful till other tests have been made to verify them. Testing and recording should be continued till complete and unquestioned records of tests covering the entire subject are entered in our transactions.

Studies into the application of this data to the actual heat losses of buildings should then be undertaken and comparison should be made to determine the additional loss from leakage of joints in putting these materials together.

We should also determine the heat losses that are occasioned when such materials absorb dampness from the outside which must be offset by the heat from within the building.

A committee of the society should be charged with the work of collecting data relating to losses of heat by railway cars at different rates of speed plus the wind velocities up to the severest gale they have to travel through.

FUEL.

While certain designated committees are working out heat loss problems, other committees should be working on problems connected with fuel by investigating the different kinds of coal, wood, peat, oil, natural gas and artificial gas.

The kind of fuel and the place or part of the country from which it is produced, the best way to liberate its heat for the purposes advocated by the members of this society.

The geological department at Washington has prepared numerous reports on this subject and has tabulated data of tests of the value of the different kinds of fuel. This society should collect this data and add to them from its own experiments and tests anything of value that may be necessary to complete the work to a point that our records will give to its members a complete analysis of the subject, supplemented by a digest of the results for ready reference.

Other committees should be investigating appliances for the economical utilization of heat. This field is very wide and begins with the furnace in which the fuel is combined with the necessary elements to produce combustion. Then follows the heat absorbing surfaces that are placed on or in connection with the furnace to take up the heat for distribution or utilization. The appliances offered for this purpose are numerous; are they the best that can be devised? Have we investigated, tested and proved them to the extent we should have done?

A careful survey of the field will show that investigation and testing of these appliances from a scientific standpoint has only just begun.

A great deal of good work has been done by the society in the ventilating branch of the art particularly during the last six years. The data gathered in tests of fans or blowers to determine their efficiency is very creditable to the gentlemen who have given their time and thought to the investigation of these appliances.

The work should be continued till the practice is standardized and the data

collected into a convenient form for reference.

Standard practice for velocities in pipes or ducts for conveying air for ventilation should be adopted by the society as soon as it is sure such standards have been demonstrated as being correct.

Friction tables for different sizes of pipe at these velocities should also be figured out by committees and the results tabulated for convenient reference before being entered into the transactions of the society.

Methods of tempering, conditioning and regulating the flow of air need standardizing, and opportunities for doing so will be frequent and they should be taken advantage of when offered.

The society in its efforts to improve the art of ventilation should be in touch with the factory inspection departments of every state that has an active department for this work.

From these sources valuable data can be had that will enable the society to offer suggestions for improving their conditions.

In this connection there is a great opportunity for the members of this society and the profession to improve the atmosphere of our factories by conditioning the air to the extent that the product of certain factories may be improved by such conditioning or the output increased by keeping the air in the plant always at the condition best suited to its output.

It has frequently been observed that factories cannot turn out work with uniform speed or quality, and the state of the weather is given as the cause.

A proper supply of well conditioned air would probably overcome these troubles.

It is impossible to give a complete program of work to be done in a paper of this size, but the foregoing, I hope, will be sufficient to awaken the members of the society to a full appreciation of the opportunities for advancing the art that are within their grasp.

Heating and Ventilation Laws and Regulations in the United States

REQUIREMENTS OF RECENTLY-ENACTED AND OTHER LAWS NOW ON THE STATUTE BOOKS IN THE VARIOUS STATES.

VI.

VERMONT.

Under date of May 1, 1911, the State Board of Health of Vermont issued regulations which include, among other things, the requirements for heating and ventilating school and other public buildings. These sections are given herewith:

EXTRACTS FROM PUBLIC STATUTES OF VERMONT.

Section 5412. The words "public buildings," as used in this chapter, shall mean churches, court houses and municipal rooms, school buildings, school and society halls above the second story, hotels and restaurants more than two stories high, all buildings more than two stories high used or rented for tenements, boarders or roomers, and places of amusement one story or more in height; also, factories, mills, workshops or other manufacturing apartments more than two stories high, in which persons are employed above the second story.

Sec. 5413. Said board shall take cognizance of the interests of life and health of the inhabitants of the state, * * * and, when requested, or when, in their opinion, it is necessary, shall advise with municipal officers in regard to drainage, water supply and sewerage of towns and villages, and in regard to the erection, construction, heating, ventilation and sanitary arrangements of public buildings; * * *

Sec. 5416. Said board shall, when necessary, issue to local boards of health its regulations as to the lighting, heating and ventilating of school houses, and shall cause sanitary inspection to be made of churches, school houses and places of public resort, and make such regulations for the safety of persons attending the same as said board deems necessary. Public buildings now standing or hereafter erected shall conform to the regulations of said board in respect to sanitary conditions and fire escapes necessary for the public health and for the safety of individuals in such public buildings.

A person, corporation or committee intending to erect a public building shall submit plans thereof showing the method of heating, plumbing, ventilation and sanitary arrangements to said board, and procure its approval thereof before erecting such building.

Sec. 5417. A person, corporation or committee which erects a public building without the approval and without complying with the regulations of the State Board of Health as provided for in the preceding section, shall be fined not more than five hundred dollars nor less than one hundred dollars, and shall make such building to conform to the regulations of said board before the same is used, otherwise such building shall be deemed a nuisance, and be put in proper condition by the local health officer under the direction of said board at the expense of the owner.

Sec. 5418. Said board may examine or cause to be examined a school building or an outhouse and condemn the same as unfit for occupation or use, and a building or outhouse so condemned by written notice served upon the chairman of the board of school directors or the person having such school in charge, shall not be occupied or used until the same is repaired and the sanitary conditions approved by the State Board of Health. A person who violates a provision of this section shall be fined not more than fifty dollars nor less than five dollars.

REGULATIONS.

The following regulations are intended for architects, corporations, committees or other persons intending to erect public buildings:

1. Plans of each floor, including basement and attic, if the attic is to be occupied, and front and side elevations, also plans and sectional detail drawings of the proposed systems of ventilation, plumbing and heating, and fire escapes, shall be submitted to the local health officer, or State Board of Health.

* * * * *

6. The heating and ventilating plans of hospitals and public buildings shall meet the following requirements:

(*a*) The heating apparatus must be of sufficient capacity to warm all rooms to 70° F. in any weather.

(*b*) With the rooms at 70° F. and a difference of not less than 40° F. between the temperature of the outside air and that of air entering the room at the fresh air inlet, the inlet pipe must supply at least 30 cu. ft. of air per minute for each person which the room will accommodate, unless otherwise directed.

(*c*) The inlet for fresh air shall be so located that no uncomfortable draughts can be felt on the breathing zone, and the difference in temperature on the breathing zone at any two points will not exceed 3° F. To accomplish this, inlets for fresh air should usually be placed well up toward the ceiling on the wall of the rooms.

(*d*) Openings for outlet ducts should usually be placed on the same side of the room near the floor, and these ducts should be heated or supplied with exhaust fans, and be of sufficient size to remove an amount of air equal to that supplied by the inlet ducts.

(*e*) The closets and fixtures must be so located and arranged that no odors can reach any occupied rooms, and all plumbing shall conform to the plumbing regulations of the State Board of Health.

To secure the approval of the State Board of Health, of heating and ventilating plans, the above requirements must be guaranteed in the specifications accompanying the plans.

In school buildings, and all public buildings of assemblage, the number of occupants it is intended to accommodate shall be stated, also the arrangement of seats and aisles.

* * * * *

WARMING AND VENTILATING SCHOOL HOUSES.

The heating apparatus must be of sufficient capacity to warm all rooms to 70° F. in any weather.

Not less than 30 cu. ft. per minute of pure air for each pupil should be supplied, and it should be so introduced that there shall not be uncomfortable draughts. The difference in temperature between any two points on the breathing plane shall not exceed 3°. The ventilating flues shall be of sufficient size to readily introduce and remove the requisite amount of air from the room.

In rural houses of one room where a furnace is impracticable, the above conditions can most economically and satsfactorly be met by the use of the "jacketed stove." The ordinary wood-burner box stove may be surrounded by a casing, or jacket, of galvanized iron, with proper air space of six to nine inches between jacket and stove. Fresh air should be conveyed from the outside of the building through tin tube to space under stove.

The vent or foul air pipe (also of tin) should be set on legs, with an opening at the bottom, 12 in. from the floor, to run straight up through the roof as high as the chimney. The stove-pipe should enter this at not more than 6 ft. from the floor, passing up as far as possible before it leaves the vent pipe for chimney. There should be a door in the jacket at the rear end of the stove which can be opened for pupils to warm their feet.

A room 28x30x12 would have 10,080 cu. ft. of air. Thirty pupils in this room would require at least 900 cu. ft. of fresh air per minute. To supply this amount of fresh air would require a tube 24 to 30 in. in diameter. In order to properly warm this volume of air in the coldest weather it would be best that there should be two of the jacketed stoves, each receiving fresh air through a 12 or 15-in. tube. The foul air vent should be of corresponding size. All of these pipes should be provided with dampers to regulate the inlet and outlet of air.

(Copies of this circular may be obtained of Dr. Henry D. Holton, Secretary, Brattleboro.)

New Books.

PROGRESSIVE FURNACE HEATING, by Alfred G. King, is the title of a new manual devoted to the designing, estimating and installing of modern warm-air furnace systems for heating and ventilating buildings. There is also included a treatise by William Neubecker on the construction and patterns of furnace fittings. The work is designed as a practical hand-book for contractors and mechanics and is a valuable contribution to the movement to place furnace heating on an engineering basis. At the same time, its simple arithmetical terms are easily understood, so that the manual may be used with profit by all engaged in this line of work. The working plans and methods of estimating, which are included in the manual, are based on sound practice and will receive the endorsement of heating engineers generally. The present movement to eliminate the word "furnace" from the warm-air heating trade makes the title of the book its only discordant note. The manual is well illustrated with 189 drawings and photographic reproductions. Size, 6 x 9 in., pp. 280. Price, delivered, $2.50. Published by The Sheet Metal Publication Co., Tribune Building, New York, or may be had through the book department of THE HEATING AND VENTILATING MAGAZINE.

VENTILATION AND HUMIDITY IN TEXTILE MILLS AND FACTORIES, by Cecil H. Lander, lecturer in civil engineering in the University of Manchester, England, is the title of a new book designed especially for the use of managers and owners of textile mills, especially those located in tropical countries. The author, in his preface, refers to the requirements now in effect in Lancashire, England, where the Factory Acts now require that if the wet-bulb temperature in a weaving shed reaches a certain specified maximum, all artificial humidification shall be cut off. The author has considered his subject mainly from the point of view of abating these high temperatures. All of the principal types of English humidifiers adapted for this work are described and the appendices give the regulations as to humidity and ventilation in cotton cloth factories, record of humidity for use in humid sheds of such factories and other data. Crown 8 vo. Pp. viii-176. Published by Longmans, Green & Co., New York, or may be had through the book department of THE HEATING AND VENTILATING MAGAZINE. Price $1.40 net.

Fan Drive as an Automobile Test.

A unique method of testing automobile engines during the process of construction, is reported by *Popular Mechanics,* which states that the motor and chassis are assembled complete with the exception of the wheels. In place of the rear wheels, two large pulleys are hung on the axle, and belts are run over them up to overhead fans. Pipes from these fans are led to the front of the chassis and curved downward so that air is blown down upon the motor, radiator and chassis. In this way the motor drives an actual load, accurately determined, similar to a road test, while at the same time it cools itself just as if it were speeding along the highway at 30 or 40 miles an hour.

Brass Screw Holes.

Brass screw holes, made to fit all sizes of screws, are a new product recently brought out by the Stine Screw Holes Co., Decatur, Ill. The screw holes are furnished in two general types, No. 1 screw holes being adapted to all places where screws are commonly used and are threaded for either wood screws or machine screws. They are driven into the wood, the outer receiving end being flush with the face of the receiving piece of material. No. 2 screw holes are the reverse of No. 1, the inner receiving end being beneath the face of the receiving piece of material, the screw entering it from the opposite side, instead of the face side as with No. 1. No. 2 screw holes are especially adapted for such places as on the inside of all sorts of cabinets and furniture drawers, to take the place of the loose projecting nuts and ends of bolts now in common use. They are flush with the inside of the drawer and the handle screws enter them from the handle side. They are also used in joining all sorts of cabinet work and in other places of similar nature. Mounted samples may be had on request by those interested.

Kelsey Automatic Humidifier.

An interesting device, designed to supply at limited expense, for installation in old or new warm-air heaters, sufficient moisture to give the indoor air the needed humidity, has been developed by the Kelsey Heating Co., Syracuse, N. Y., and is known as the Kelsey automatic humidifier. It consists of a cast-iron container (aluminum coated) placed in the center of the warm-air chamber. A small galvanized pipe connects through the casing top to a storage tank located in the cellar. A feed water pipe from the main supply attaches directly to this tank. The container is supported by a perforated metal band, 4 in. wide, placed on the upper deck dome of the heater. The storage tank is supported from floor joists by metal strips at the requisite height to allow the bottom of the overflow opening to be ½ in. below the level of the top edge of the container. This device is made in two styles and is listed at $22.50 and $19.50.

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JUDGING from the character of the discussion now going on relative to the merits of ozone for ventilation purposes, especially that conducted by those whose conclusions have led them to oppose its use, it is evident that the proposition must go through the mill of biased argument before the actual facts are settled to the satisfaction of the engineering world. In these days of scientific advance, one might have expected that this matter could have been settled strictly on its merits, without recourse to prejudice, yet after reading of the most extensive laboratory tests yet conducted, it is impossible to escape the impression that the comments made on the tests, as published in our last issue and as presented in a paper on the subject before the heating engineers' society, were generally justified, and that the conclusions made by the experimenters are susceptible of radically different interpretation.

A rather new aspect of the general subject was brought out in a recent discussion on the chemical composition of odors, "for," said one speaker, "we do not know the chemical properties of odors, and it may be a question whether ozone destroys or neutralizes odors. When it is considered that sandal wood, for instance, will give forth an odor for 2000 years, it will be seen how subtle a thing we are dealing with."

RECENT developments of air moistening devices for use in connection with warm air furnaces, or warm air "heaters," as the new association of furnace manufacturers would have them called, are a welcome indication that this feature of furnace heating is at last receiving the scientific attention of which it has been sorely in need. It is safe to say that outside of the possible leakage of carbon monoxide to the entering air, which, by the way, may be said to be practically eliminated in modern furnace construction, the one thing that has stood effectually in the way of the wider acceptance, by engineers, of furnace heating is the excessive dryness of such heat. This fact, of course, has long been recognized, but most of the efforts that have been made to remedy the trouble, such as the familiar water pan in the furnace casing, have been so pitiably inadequate as to cast a stigma upon the system itself. During the past month no fewer than three distinct types of humidifying apparatus for furnaces have been announced to the trade and it is evident that a general awakening has taken place in this important matter.

WITH this issue we conclude the publication of the new heating and ventilating laws and regulations in the United States, and also those which have undergone change or modifications. All of these, as well as the standing laws in other States, will appear in the third edition of "Ventilation Laws," which we shall publish at an early date.

AMERICAN SOCIETY OF HEATING AND VENTILATING ENGINEERS

Mid-Summer Meeting, Cleveland, O., July 9-11, 1914

The strategic importance of a meeting of The American Society of Heating and Ventilating Engineers in Cleveland, July 9-11, 1914, with headquarters at the Hotel Hollenden, was shown in the influx of new members from that city, which will add materially to the society's strength. Both the professional and entertainment programmes were carried out under excellent weather conditions and were thoroughly enjoyed by all who were so fortunate as to participate in them.

MORNING SESSION, JULY 9.

The opening session was held Thursday morning with President S. R. Lewis in the chair. Following the usual preliminaries President Lewis presented his address.

THE IMPORTANCE OF A PROPER PERSPECTIVE.

One of the limitations of the human mind is its normal inability to become sufficiently detached as to view things in their proper perspective. After taking the utmost care in refining some detail of a process we operate for years with combinations of such refined details in connection with the most redundant, unconsidered rules of thumb, we are prone to follow precedent or to be conventional, at the expense of progress. We fail to view a clear perspective.

The history of medicine, electricity and mechanics teems with instances in which we groped all around radical improvements, finally to stumble over them. At how many points we have failed yet to stumble no man knows. The improvements in heating and ventilating have largely been developed by the stumbling process. The most elaborate computations will be made, for instance, of heat losses, pipe sizes and radiator surfaces, affecting possibly one-third of the cost of an installation and then we find that the designer guessed at the chimney size or type or height—took an incompetent manufacturer's rating on a boiler, or rendered abortive his own detailed computations by assuming that the manufacturer's competitive guess as to the capacity and efficiency of his particular apparatus, was correct.

The men whose minds have risen above the commonplace and who have been able clearly to view the perspective are our great men today. They have been able to devote their efforts to *all* the weak places without useless devotion to a few futile details. The capacity for infiinite care and pains, which is said to form genius, the rank and file of us can understand.

IDEAL OF SOCIETY IS SUCCESS FOR ALL.

Our ideal of this society is success for all. That all may succeed it is not necessary that any shall fail. The process of developing, by careful committee work, by consultation with successful outsiders, by individual genius, such as we have in our membership, is progressing safely and sanely, and our proceedings from year to year are surely becoming more and more enriched with valuable information.

I desire to emphasize, however, the necessity of proper perspective and in doing so suggest some questions which I believe the future will prove worthy of our most earnest consideration.

CONSERVATION OF NATURAL RESOURCES.

Overshadowing everything else is the question of conservation of natural resources. For how much longer may we waste stored heat resources to save first cost only, of buildings? Our instinct is so to live as to make living for our descendants a better proposition. How are we intelligently following this instinct?

Nature provides winter coats for the animals that must remain out in the cold

We learned long ago to insulate our bodies partially against the cold with warmer winter clothing. Have we approached seriously the application of this idea to our buildings? We refine the artificial heating plant, spend time and dollars and skill and genius in elaborating the heat transmitting appliances and the fuel consuming devices with no more than a cursory investigation of the type of construction of the building, and with no effort to influence the construction of the building so as to reduce the heat losses.

Many of us, I believe, stand convicted of crime in this regard against future generations. There are instances available where 5% of the cost of the building, expended on heat transmission insulation rather than on a larger heating plant, saved in fuel charges alone its cost within three years. The field this opens up is almost unexplored. We know, however, how much more efficient as regards heat insulation is an ordinary sawdust packed icehouse than an ordinary dwelling, and how much longer heat is retained in an ordinary fireless cooker than in any part of the best insulated transmission department of an ordinary heating plant.

IMPROVEMENTS NEEDED IN BUILDING CONSTRUCTION.

We know that poor insulation of walls and windows is the greatest enemy of good ventilation, preventing proper diffusion of the fresh air. We know that tight windows or storm sash permit of very considerable fuel savings. We know that warm winter buildings are cool summer buildings. We know that a $10,000 investment with a 5% interest charge is better for the borrower than an $8,000 investment with a 20% interest charge. We seem, however, unable to get perspective enough to use this knowledge, else buildings with rattling windows and no storm sash, thin walls, cold attics and cellars, direct-indirect radiators, unduly high ceilings, single slab roofs, etc., coupled with the most elaborate and expensive heating plants, would cease to exist.

LOCATION OF HEAT SOURCE.

In our practice as engineers are we losing perspective in regard to the location in the room of the heat source? We learned, very early in our experience, that the heat transmission varies, among other things, in a certain proportion as the difference in temperature between the hot and cold objects varies. Is it then the best practice to place the hottest thing in a room against the coldest object? The dean of one of our greatest engineering schools agreed with me that in most instances the radiator location was far more a factor of the convenience of the occupants of the room than of their comfort. Granted reasonably tight windows and fairly well insulated walls, the radiator may be alongside the inside wall as satisfactorily as alongside the outside wall. May not the radiator be smaller—will not the piping be less expensive—will not the fuel cost be lower, if this procedure is carried out consistently?

COLD AIR FOR VENTILATION.

It is not a loss of perspective to cling to the idea that air for ventilation shall all have been heated prior to its entry to a room? Our belief in this is traditional. Is it based on truth? It has been demonstrated that unheated air may be introduced into rooms under certain peculiar ideal conditions, and that under these conditions the air feels better to us than air which has been heated. This process has proven good for street cars. Shall we not hope for the development of the process for buildings, so perfected that it shall operate continuously and effectively? I believe that it will surely follow the construction of properly insulated buildings, and that we cannot attain approximately perfect ventilation until we build insulated buildings.

MOISTENING AND DIRT REMOVAL FROM AIR TWO SEPARATE PROCESSES.

Is our perspective normal as affecting air cleaning apparatus? Are there no other natural processes from which we may take a hint aside from the reduction in atmospheric dust after rain? Will not our progress accelerate when moisture content and dirt removal from air are seen as clearly as separate processes? It is impossible to bring forth an air cleaner which shall operate continuously, economically and efficiently at less original and maintenance cost than the modern commercial air washer, and thus become more popularly possible? Is

HEATING ENGINEERS AND GUESTS AT NELA PARK, CLEVELAND, OHIO, JULY 10, 1914.

there no device which can do for our homes approximately what our nasal functions do for our lungs? Despite the dust which autopsies show these cleaners have let by, are they not more efficient than any of our artificial cleaners?

I have attempted to suggest some improvements to stumble over some perspectives to be viewed.

By the friendly contact of our organization and a helping hand, many of us will stumble over desirable elements to success.

By the inspiration of this society's contact many of us may climb the heights enclosing our narrow valley and view the distant peaks of achievement in a perfect perspective. Those of us remaining, who can neither stumble or see, forming the rank and file, who are achieving genius by infinite care and pains, will always find, I hope, in the contact engendered by our organization and our meetings some alleviation of the grind of life's turmoil.

Secretary Blackmore told of the work done since he became secretary in March. This included a report of the society's present financial condition, which was shown to be excellent, the receipts to date being $4,010 and the expenditures $3,617. The present balance on hand is $3,216. A balance is owing on dues amounting to $1,945.

Mr. Blackmore told of a visit he had made to Princeton University, where he succeeded in interesting a number of the professors in the work of the society, with the prospect of securing their co-operation in the way of making tests and providing for instruction in heating and ventilating engineering.

A letter was read from Mrs. Frank L. Busey offering to the society the paper on "The Development of the Centrifugal Fan," which was presented by Mr. Busey to the New York and Illinois Chapters and which had been revised by the author shortly before his death. President Lewis announced that he had written Mrs. Busey, accepting the paper on behalf of the society.

CHAPTER REPORTS.

Chapter reports were presented from the Illinois, New York and Massachusetts chapters, covering their work for the previous year. The Illinois Chapter report stated that the idea adopted of carrying on debates on given subjects had been a success. It was announced that a preliminary report of the Chicago Ventilation Commission would shortly be published.

The first paper on the program was that by James A. Donnelly on "Tests on the Heat Transmission of Direct Radiators at Low Differences in Temperature, Also on the Heat Transmission from Steam to Water in Special Form of Convertor."

In discussing the paper Willis H. Carrier stated that the transmission varies considerably in different types of standard radiators. He thought most transmission figures were too high and that a transmission of 1.6 to 1.8 B. T. U. per square foot per degree difference had been secured in his own tests.

Prof. John R. Allen said that it was also necessary to have a standard room and that dry steam should be used. He said the same radiator located in an ordinary room and in a greenhouse would give much different transmission figures, amounting perhaps to 20%.

Mr. Donnelly said that by placing the thermometer below the radiator, the varying air conditions in the room would not effect the tests so much, especially as the tests depend principally on the air immediately surrounding the radiator rather than that of the room itself.

A committee report, prepared by A. M. Feldman, chairman, was presented on "Reducing Fire Risks in Blower Systems Used for Heating and Ventilating." This report was one prepared for the National Fire Protection association and was published, practically in full, in THE HEATING AND VENTILATING MAGAZINE for May, 1914.

Secretary Blackmore, who read the report, said that it was a striking instance of the co-operation that was possible between different engineering bodies and that, by having heating engineers on the fire protection association committee it was very likely that points had been covered or omitted that were of distinct advantage to the heating engineer.

Mr. Donnelly urged a full discussion of the report as any modification of the

requirements could be far more easily made now than after they were adopted by the Board of Fire Underwriters, which would be probably within another year.

It was voted to refer the report as presented, together with that part referring to refuse conveyance, to the next annual meeting of the society when any desired modifications could be acted upon.

A report was given of the Washington conference on the matter of standard flanges and flanged fittings, resulting in the preparation of the "1915 Standard," with a recommendation that it be adopted by the society. The report was received without further action.

A report of the educational committee which has been working with a similar committee of the National District Heating Association was presented, embodying the report as given to the district heating engineers. The matter will be referred to the publication committee.

A preliminary report was presented of the committee for standardizing a method of testing air washers, by Alfred E. Stacey, Jr., chairman. In discussing this report, which is presented on another page of this issue, W. G. R. Braemer presented a written discussion, also given on another page.

The offer made by Mr. Braemer, it was stated, would be very acceptable to the committee.

AFTERNOON SESSION, JULY 9.

At the opening of the afternoon session, Prof. J. D. Hoffman presented a revised model compulsory ventilation law. This was a lengthy document covering theaters, schools and factories and was intended to be a preliminary report which would be further amplified for the annual meeting.

In discussing the report Theodore Weinshank maintained that where the specified quantity of air to be delivered is mentioned, and also the CO_2 content, as is done in the report, the society is attempting to establish two standards. This, he claimed, cannot be done, as one is a function of the other. Cases might be found where the required quantity of air was delivered and yet the CO_2 might rise above the limit. The chair made the statement that this provision was made on the ground that the CO_2 is but one of the matters to be considered in connection with the air supply.

J. I. Lyle advocated a substituting clause to the effect that the CO_2 must not rise over that of the incoming air beyond a certain point. This, he said, would take care of the point raised by Mr. Weinshank.

At this point a gracious act was taken by President Lewis in calling to the chair Past President John R. Allen and asking him to preside for the remainder of the session. During Prof. Allen's incumbency of the presidency he was stationed in Constantinople, Turkey, and President Lewis expressed the opinion that on this account he felt it proper to have Prof. Allen exercise the functions of presiding officer which he was deprived of by his absence.

Prof. Allen was greeted with applause as he stepped to the rostrum and in short address expressed his appreciation of the courtesy extended him. He then assumed the chair and the session proceeded with the reading of a paper on "Car Ventilation" by D. I. Cooke. Before the discussion was opened, a paper on a similar subject was presented, entitled, "Car Heating by Electricity and Temperature Regulation in Connection Therewith," by W. S. Hammond, Jr.

Mr. Cooke's paper included a description of the ventilating equipment of the Chicago trolley cars, together with the results of tests made on them. This is an exhaust ventilating system which includes a direct-connected exhaust fan and motor drawing air through a series of outlet registers, the main air inlet being located in the car floor.

Mr. Lewis called attention to the possibilities of the use of exhaust ventilation in connection with more tightly-constructed buildings and believed the members were about to "stumble" on something as outlined in the president's address.

A paper not listed on the program was then presented by O. J. Kuenhold on "Natural Gas Heaters." This paper was devoted to a system of combustion developed by the author which he described in detail and which is embodied

in the product of the Scientific Heater Co., Cleveland.

J. A. Donnelly then read a paper on a "Suggested Formula for Calculating the Necessary Amount of Radiation for Heating Rooms by Hot Water," particularly applicable to the heating of all-gas kitchens by hot water from a furnace coil or a water heater.

A SCHEME FOR HEATING DURING MILD WINTER WEATHER.

In connection with a topic for discussion, on "To what extent can we economically use manufactured gas for heating?" a written discussion was submitted by Reginald Pelham Bolton in which it was brought out that a very small use is made of a heating plant during the latter part of the heating season in New York City and that this condition is accompanied by an excessively costly steam production during such moderate periods of usage.

"The building in which the observations were conducted," continued Mr. Bolton, "is a 7-story business building heated by low pressure steam raised in an Acme heating boiler and supplying about 1,600 sq. ft. of direct radiation. The basement and first floor are heated by an indirect system.

"The operation of the plant during the period of observation, which commenced February 28, was carefully watched, and all the condensation from the radiators was measured by a meter which was calibrated on several occasions; all coal was weighed out and also the ashes, as removed.

"The coal used is an egg anthracite of excellent quality, costing $6.50 per ton of 2,000 lbs. The labor consists of one man, who was paid at the rate of $10.00 per week.

"The evaporation per pound of this fuel from and at 212° F. fell from an average of about 8.3 lbs. at the beginning of March, to a low point of 0.7 lb. of water per pound of coal, in the last week of the observations, ending May 16. The percentage of unconsumed material removed from the ash pits rose from an average of about 17% to as high as 27 to 31% by weight.

"The efficiency of the boiler declined from an average of 64% to 18.5% and during the last week was only 5.5%.

"The actual cost of fuel during the last eight weeks of observations was $93.13, and the cost of labor was $80.00, making the total $173.13. The comparative cost of city gas at 80 cents per 1,000 cu. ft. for the same period, assuming an efficiency of evaporation of 90%, would have been $168.17, so that the use of gas during these eight weeks would have been nearly $5.00 cheaper. During the last four weeks of the test, there would have been a direct saving of $48.64 by the use of gas."

Mr. Bolton stated similar heating conditions prevail in the earlier part of the season, the average outdoor temperatures being given as 49.8° for the first eight weeks and 49° for the last eight weeks.

"The observations," he concluded, "thus appear to demonstrate that even at the price of 80 cents per 1,000 cu. ft. manufactured gas could be utilized economically for house heating over a period of about 16 weeks. The total heating season is 32 weeks, and therefore these conclusions apply to one-half of the total heating season."

Mr. Bolton's remarks aroused a lively discussion. Among the points brought out was the fact that an efficiency of 90% for manufactured gas was hardly possible, especially as it is necessary to have a high flue temperature in order to carry off the heavy products of combustion. The point was also made that heaters cannot be used interchangeably for gas and coal.

Among the speakers was George S. Barrows, chairman of the committee on heating, ventilation and refrigeration of the National Commercial Gas Association, who bespoke the interest of the society in such problems as heating calculations for kitchens using gas stoves exclusively for cooking. Such rooms, he said, could not be heated economically with the gas stoves. He maintained that any coal burning boiler could be adapted to the burning of gas.

At the close of his remarks the session adjourned.

MORNING SESSION, JULY 10.

R. W. Pryor, Jr., opened the Friday morning session with a paper on "Reduction or Elimination of Noise Attending the Operation of Mechanical Ventilating Machinery" (published elsewhere

in this issue). In the course of the discussion Prof. Allen brought up the matter of synchronism and instanced a case where a large fly wheel was deflected 1½ in. at a certain speed so that it grazed the side of the pit. By increasing the speed two revolutions per minute, the trouble was entirely eliminated.

The next paper was on "Ventilation of Telephone Booths," including other applications of small unit sets by R. L. Douglass, in which it was shown that there are more engineering and mechanical problems to solve than would at first appear.

President Lewis suggested that in place of range hoods, which, he said, serve to accumulate dirt, the ceiling be furred down forming a separate room and the blower placed within this room. Mr. Pryor that the accumulation of grease might make such an arrangement a fire hazard.

Mr. Hart brought up the matter of ventilating grill rooms and urged separate ventilating units for such quarters.

A paper on "Air Ozonation," by Milton H. Franklin was then read in which the author summarized his previous studies on this subject (published in THE HEATING AND VENTILATING MAGAZINE for October and November, 1913), and also analyzed the experiments recently made by Jordan and Carlson.

Prof. Allen made the point, in discussing the paper that we do not know the chemical properties of odors and that it may be a question whether ozone destroys or neutralizes odors. When it is considered, he said, that sandal wood will give forth an odor for 2,000 years, it will be seen how little we know of the composition of various odors. He said it was very likely that the use of ozone results in "olfactory compensation" in a manner similar to that in which many odors are neutralized by others.

He said we have no means of measuring odors, outside of the sense of smell, so that our only instrument at present is the "olfactometer," which, he explained, was the human nose.

Prof. J. D. Hoffman presented a written discussion in which he praised the character of the tests made, but considered the conclusions as somewhat too sweeping in that effects of a few days were not to be taken as indicating permanent effects. He urged the use of small concentrations of ozone, at least when first operated. As regards odors, he stated that many of these had been shown to be in themselves harmless.

J. I. Lyle called attention to the serious effects of crowd odors on many persons, resulting in faintness, nausea, etc., showing that so-called harmless odors may have a distinctly bad effect.

The concluding paper at the morning session was presented by Norman A. Hill on "The Heating Industry in Canada." Mr. Hill referred more particularly to conditions in Toronto, which he showed had undergone a remarkable growth in population during the past seven years.

His remark that the separation of contracts had made considerable progress in Canada brought forth a statement from D. D. Kimball that the separation of that portion of the work dealing with the mechanical equipment of buildings was making such headway in the United States that he hoped soon to see it extended throughout the Union. He said there was a growing tendency among American heating engineers to include lighting and plumbing in their professional work.

The session closed promptly at noon, the topical discussions being omitted, to enable the convention to go in a body, immediately following luncheon, to the National Lamp Works of the General Electric Company at Nela Park.

MORNING SESSION, JULY 11.

The final session Saturday morning was opened by the reading of a paper on "Hydro-Electric Power Compared with Steam," by Reginald Pelham Bolton. Mr. Bolton's conclusions were in favor of the use of steam and this brought forth the comment from Norman A. Hill that in Canada local pride is partly responsible for the growth of hydro installations on account of the fact that the coal and most of the machinery for a steam power plant must be purchased in the United States and therefore the proceeds of the initial investment really go to the United States.

Secretary J. J. Blackmore then read a paper on "Our Society, Its Aims and

Opportunities," which took up the many things yet to be undertaken by the society and by heating engineers generally.

Norman A. Hill referred to the matter of reproducing outdoor weather conditions and said that we must first determine what we mean by a perfect day. He also said that we may have to take up the matter of illuminating as part of the problem of ventilation, for it is becoming apparent that lighting has a good deal to do with the question.

Mr. Bolton urged the establishment of a research fund for experimental work and expressed his opinion that with such a fund the co-operation of engineering schools could be more readily secured and possibly their funds be partially diverted to augmenting those provided by the society.

H. M. Hart read a preliminary report of the work of the Chicago Ventilation Commission, in which it was stated that the commission is about to issue a pamphlet giving an account of its inception, organization, its work to date and the plans upon which it is working. This pamphlet, he said, would be ready within a few weeks.

The meeting concluded with the reading of a portion of a paper by Frederic S. Lee of Columbia University, on ozone, which upon vote was added to the transactions as part of the discussion of Dr. Franklin's paper on "Air Ozonation." Prof. Lee cited the experiments of Jordan and Carlson as indicating doubtful features as to the efficacy of ozone.

The meeting then adjourned.

The Entertainment.

A committee of Cleveland members fairly outdid itself in looking after the pleasures of the members and guests.

A section of the Hollenden, including assembly room, dressing rooms and outdoor garden, had been set aside for the use of the society and made one of the most comfortable and convenient settings the convention could desire.

Thursday afternoon the ladies were taken on an automobile trip through the city. That evening the committe provided a musicale and collation in the assemby room of the Hollenden. The guests sat in groups at separate tables and were entertained by professional dancers and singers, during which the collation was served. Later the orchestra adjourned to the outdoor garden, where dancing was the order for the balance of the evening.

Friday afternoon, all of the delegates, including the ladies, were carried in special trolley cars to Nela Park, where is located the "University of Industry," of the National Lamp Works of the General Electric Company. On arrival at the park the party first listened to an illustrated talk on the effect of different angles of light, as well as that of different colors, on statuary, paintings and similar objects, bringing out the need of a study of the diffusion of light to which the National Lamp Works has given much attention in the development of its National Mazda lamps.

After the lecture the party proceeded to the summer camp maintained at the park by the company for the use of its employees. It was explained that the salesmen and also the women employees are entertained at the camp in sections, the usual length of stay being two weeks. In connection with the camp life, a group of tents are set aside for the instruction of salesmen regarding the company's products, and in one tent the salesmen are given the opportunity to compete in a window display competition.

Tennis courts, a baseball field, a quoit alley and an outdoor swimming pool are included on the grounds and many of the party took advantage of the invitation tendered them to take a dip in the pool.

A diversion was provided by the campers who were evidently in a playful mood, their principal pleasantry being the ducking in the pool of recalcitrant campers. Some of the campers suffered this penalty through the fact that they appeared on the grounds wearing collars and neckties. This, it appeared, is absolutely tabooed at Camp Nela.

At the close of a delightful afternoon, with ideal weather conditions, a portion of the party was treated to a repast as the guests of the camp, while others went on a tour of inspection through the various buildings. The party returned by trolley to the city in time for the banquet in the evening.

The climax of the entertainment program was reached Friday evening, when a banquet, under the auspices of the society, was given in the assembly room. As on the previous evening the dinner was followed by outdoor dancing, but before the party left the dining hall W. H. Ellis expressed the sentiment of all when he paid a deserved tribute to the activities of the Entertainment Committee in providing so bounteous a program.

This committee, which was conspicuous

by its yachting dress, was composed of Frank G. Phegley, chairman; R. S. Mayer, secretary; J. H. Bacon, Jr., treasurer; W. M. Kingsbury and F. H. Valentine. On the ladies' entertainment committee were Mrs. Phegley, Mrs. Bacon, Mrs. Klein and Mrs. Kingsbury.

A clever souvenir of the meeting was provided by the Entertainment Committee, when it distributed to the ladies, during the trip to Nela Park, blue banners bearing the emblem of the society in colors in addition to the word "Cleveland."

The committee also presented to each member and guest a copy of the group photograph taken at Nela Park.

Those Present.

Washington, D. C.—S. F. Gardner.
Canada—Norman A. Hill, Toronto, Ont.
Illinois—S. Morgan Bushnell, C. C. Cheyney, E. J. Claffey, D. I. Cooke, Robt. L. Gifford, H. M. Hart, C. W. Johnson, S. R. Lewis, Pres.; Homer R. Linn, W. E. Marquam, of "Domestic Engineering"; Chas. F. Newport, W. E. Stacey, Jr.; Jas. H. Davis, Chicago.
Indiana—Theo. Weinshank, Indianapolis.
Massachusetts—Geo. D. Hoffman, Boston.
Michigan—John R. Allen, Ann Arbor; W. F. McDonald, Detroit.
Nebraska—J. D. Hoffman, Lincoln.
New Jersey—Wm. D. Braemer and John F. Hale, Camden.
New York—W. H. Carrier, Buffalo; J. J. Blackmore, Sec.; Reginald Pelham Bolton, James A. Donnelly, Treas.; J. I. Lyle, R. W. Pryor, Jr., Frank T. Chapman, D. D. Kimball and A. S. Armagnac, New York City.
Ohio—A. C. Cripps, Akron; F. M. Mechling, Canton; M. L. Foote, Columbus; J. H. Bacon, Jr., A. E. French, Wm. M. Kingsbury, Robt. S. Mayer, Frank G. Phegley and F. H. Valentine, Cleveland; V. L. Brooks and Thomas Tait, Dayton; Oliver H. Schlemmer, Jr., Warren.
Detroit—Wm. F. McDonald.
Pennsylvania—J. E. McGinness and F. N. Speller, Pittsburgh.
Wisconsin—H. W. Ellis, Milwaukee.

Guests and Ladies.

Canada—Mr. and Mrs. M. M. Ashworth, Toronto, Ont.
Illinois—C. A. Olson and O. T. Carson, of "Domestic Engineering," Chicago.
Indiana—Mrs. Theo. and Miss Anna Weinshank, Indianapolis.
Michigan—Mrs. John R. Allen, Ann Arbor; Wm. M. Foster, Mr. and Mrs. C. C. Johnson, Daniel M. Luehrs, J. F. McIntire; H. P. Mishler, Wm. H. Price, all of Detroit; Jas. F. Firestone, Dowagiac.
Nebraska—Mrs J. D. Hoffman, Lincoln.
New York—Albert V. H. Spear and Franklin Van Winkle, New York City; W. H. Beckley, Rochester; H. G. Hart, Utica.
Ohio—Frank W. Billman, H. P. Cahill, Milton E. Murphy and W. M. P. Roberts, of Akron; Mr. and Mrs. L. M. Hunter, Chicago Junction; C. A. Anderson, Mrs. J. H. Bacon, Jr., Will Bacon, F. S. Barnum, Chas. F. Beckwith, R. J. Bissett, Mr. and Mrs. F. G. Bridges, W. H. Brewer, W. H. Buerser, Miss Alice Caldwell, Mortimer L. Crowell, S. C. Cutler, J. M. Farley, L. I. Garrett, O. Gehard, C. Gottwald, H. R. Hadlow, H. C. Hewitt, F. R. Quay, Geo. A. John, Mrs. W. M. Kingsbury, A. B. Knight, O. J. Kuenhold, Max Lezius, Mr. and Mrs. T. E. Loughnane, S. F. and J. J. McDonald. J. J. Metcalfe, J. C. and C. M. Miles, J. A. Miller, T. G. Mouat, A. K. Park, Mrs. Frank D. and Miss Myrtle Phegley, F. L. Prentiss, E. H. and G. W. Roberts, Mr. and Mrs. C. H. Rock, V. A. Root, Frank Saunders, A. P. Seltzer, Max Sizies, W. H. Smead, E. A. Stark, R. E. Stokes, O. G. Ward, Harry F. Vaughn, Howard J. Weber, G. A. Winkle, F. H. Winslow and A. C. Yost, all of Cleveland; H. Ray Redington, Elyria; Mr. and Mrs. J. P. Snapp and Adelaide Snapp, Mansfield; G. P. Riegger, Warren.
Pennsylvania—Geo. S. Barrows, Philadelphia; C. F. Hall, J. C. Hobbs and H. C. Shrew, Pittsburgh.

National Warm Air Heating and Ventilating Association.

A new movement in the interests of warm air furnace heating was definitely launched when the recently-organized National Warm Air Heating and Ventilating Association held its first formal convention in Detroit, June 23. President John D. Green opened the meeting and in the course of his address made the interesting statement that there are in this country at the present time 150 manufacurers of warm air heaters and about 30 manufacturers of accessories, such as registers, pipe, etc. The new association has at the present time a membership of 28 manufacturers of warm air heaters and eight accessory manufacturers. He also stated that there are approximately 185,000 warm air heaters made annually in the United States and that the association's present membership of 28 manufacturers makes possibly 100,000 of the total number. He appealed to all warm air furnace manufacturers to join the association.

Secretary Allen W. Williams gave an outline of the work the association had already undertaken since his appointment last March. Among other things, the association is compiling a full list of the manufacturers of furnaces and accessories, as no complete and reliable list was to be found.

Another movement undertaken by the association is the compilation of manufacturers' systems for computing their costs, with the idea of securing a formula of costs that will be simple and practical. A number of replies have already been received to the secretary's requests in this connection.

Acting upon the direction of the association, the secretary is arranging for the compilation of a list of undesirable salesmen. Under the direction of the committee on salesmen's bureau, the secretary sent a special letter to all furnace and accessory manufacturers, requesting information regarding undesirable salesmen, and explaining the purpose in view. With this letter was enclosed a printed form to be filled out and returned. The replies will be referred as they are received to the proper committee.

Secretary Williams recommended that such subjects as "freight" and such parts of "building codes" as relate to the installation of warm air furnaces might be advantageously placed in the charge of special committees and recognized as proper matters for attention.

RECOMMENDS THE WORD "HEATER" IN PLACE OF "FURNACE."

The secretary laid emphasis on the desirability of using the term "warm air heater" in referring to such goods, rather than "warm air furnace," and, if possible, some action to this end at once.

Edwin Norris, who reported for the Committee on Manufacturers' Cost Formula, said that as soon as a sufficient number of blanks and methods had been received from the various furnace manufacturers an expert would be employed to point out the defects and to formulate something that could be used as a standard.

The officers were re-elected, as follows: President, John D. Green, Detroit; vice-president, F. T. Giblin, Utica, N. Y.; treasurer, W. G. Wise, Akron, O.; secretary, A. W. Williams, Columbus, O. Executive committee: John A. Howard, Dowagiac, Mich.; E. P. Miller, Marshalltown, Ia., and Charles Seelbach, Cleveland, O.

John H. Hussie, who has been active in forming the new association, was, upon the recommendation of President Green, elected as an honorary member.

A further action taken by the convention was to ask the register manufacturers to give in their catalogues the area of the actual face opening in their registers.

Summer Meeting of English Heating Engineers.

An elaborate paper on "Some Experiments on the Loss of Heat from Buildings," presented by C. H. Avery, of the Department of Heating and Ventilating Engineering at the University College, London, was the principal item on the program for the summer meeting of the Institution of Heating and Ventilating Engineers, held in London, on June 22.

The paper told in detail of some experiments made during the past winter to determine the heat losses from a room in an office building in London which was heated by electricity. The results agreed fairly closely with theoretical calculations made according to Reitschel's method and Carpenter's and Barber's formulas. The speaker also told of similar tests made on the whole of the old University College buildings, containing some 200 rooms. He displayed charts containing plotted curves of the actual heat losses compared with the theoretical heat losses, calculated by different methods.

A. H. Barker reported that the research work being conducted at the London University College was going forward satisfactorily and that next year, in addition to the lectures, laboratory work would be carried on in accordance with a well-defined system, with the help of scientific apparatus that was now being installed.

The afternoon was given over to a trip to Hampton Court Palace. This was followed in the evening by the annual banquet at the Imperial Hotel.

The next day, "President's Day," was devoted to a trip to Guilford and Farnham, including a visit to Farnham Castle.

LEGAL DECISIONS

Guaranty for Supplies—Construction.

The defendant, the owner of three lots, sold them to B., retaining mortgages over the properties; B. was then building houses on each of the lots, for which he obtained funds from a building society. The defendant introduced the plaintiff to B., and the plaintiff gave B. an estimate for the plumbing and steam-heating supplies. The price of the steam-heating supplies was $126 for each house, and the price of the plumbing supplies was $155 for each house, making a total of $843. The estimates were accepted in writing, and the defendant thereupon endorsed on the estimates as accepted: "I, A., agree to be on hand when Mr. B. receives his final payment on each house, and see that a check for amount of this bill is made out." The plaintiff thereafter furnished the materials called for by his contract, as well as extra material to the value of $78.92, amounting in all to $981.92. He gave credit of $60.04 for extra material delivered. He received a check for $200 on account, and brought suit against the defendant for the balance due on his contract, on the theory that the defendant had guaranteed payment of his account. It was held that the defendant's agreement could not be construed as an absolute guaranty of payment. At most it was a guaranty of payment of the particular goods covered by the estimates out of the funds payable to B. at the completion of the houses. The amount of the extra materials was not included in the guaranty.—Neuberger vs. Bliss, New York Appellate Division, 147 N. Y. Supp., 34.

Action for Installing Heating Plant.

A contractor undertook to install a heating plant in a residence, according to certain plans and specifications provided, for $340. The contract provided that the plant should be put in in a skillful and workmanlike manner, and would heat the house according to the requirements of the specifications. It provided that if any alterations were made in the installation under the direction or with the consent of the owner, a reasonable amount for any extra work or

material should be paid by the owner. In an action by the contractor for the contract price, for extra work and materials, it appeared that alterations and deviations were made, some admitted to be under the direction of the owner, others which he denied were made either with his direction, knowledge or consent. The owner also insisted that the plant did not meet the requirements and specifications as required by the contract; and that these deviations consisted in a change of the make of the boiler installed, insufficiency in the size of the pipes used, insufficiency of the plant to heat the house as required, and also that specifications and contract required that the plant should be put in so that there would be no knocking or hammering in the radiators, that the steam in circulating should be free from any noises. The total amount of the alterations made, extra material furnished, and extra labor performed, as claimed by the contractor, amounted to $82.31. A trial resulted in a judgment for the original price, and the owner appealed.

The questions involved were principally questions of fact relating to the questions as to whether pipes used in this plant were of sufficient size, whether they were properly installed and whether all the material agreed to be furnished was furnished and installed, and whether or not the owner consented and agreed to the changes and alterations that were made. One of the owner's principal contentions was that the plans and specifications required a boiler of the American Radiator Company make, and that the one installed was one handled by the contractor not made by the American Radiator Company, but by another firm, and known as "Our Own." The evidence upon the question as to whether the owner consented to the substitution of this boiler was conflicting, but it appeared that the boiler was taken to the owner's house and placed upon his lawn, that while there he saw it and knew that it was not the make called for by his contract, but that he made no objection to its installation or use, and did not object to the substitution of this boiler for the reason that he wanted to move into the premises as soon as possible. There was no evidence that, so far as capacity or quality of the boiler was concerned, the one installed was not equal to that specified. There was a dispute as to whether some of the pipes were of different size. The evidence showed that the pipes originally put in the plant were placed within the walls of the building as required, that in order to replace them with larger ones it would be necessary to cut into the walls either from the outside or inside, that to do this would cost from $150 to $200; that if the pipes were of sufficient size and the plant of sufficient capacity and quality to perform the work required of it, then the other defects which were pointed out could be replaced or repaired at an expense of not more than $75. The evidence was held to sustain the judgment for the contract price. —Dawson vs. Davis, 181 Ill. App. 15.

Manufacturers Agree on House Heating Boiler Ratings.

Definite steps taken by the manufacturers of house heating boilers towards a uniform rating for such boilers were reported at the recent convention of the National Association of Master Steam and Hot Water Fitters and are now announced in the association's *Official Bulletin*. It appears that at a meeting of the National Boiler and Radiator Manufacturers' Association, held June 8, 1914, the following resolution was adopted:

That a boiler having a rated capacity of 2,000 sq. ft. steam rating or less shall be known as a house heating boiler.

That it shall not be necessary to fire house heating sizes of boilers more often than once in eight hours to carry their rated load continuously.

That a water boiler rating shall be 65% greater than steam rating.

That coal used to determine ratings shall contain 12,000 B.T.U. per pound of coal as fired.

That a boiler rating shall be based on a condensation of 0.25 of a pound of steam per hour per foot of radiation.

That the area of the vertical smoke flue and its height shall be great enough to provide a sufficient draft to consume with proper combustion the required amount of fuel per hour.

The letter containing the resolution was signed by P. M. Beecher, president; William Ritchie, secretary, and W. S. Dickinson, acting secretary of the National Boiler and Radiator Manufacturers' Association.

It will be recalled that in the report of the committee on standardization of the Master Fitters' Association at Niagara Falls, dated June 25, 1913, the committee recommended that the secretary be instructed to correspond with the several manufacturers of house heating boilers and request them to publish a rating for their various sizes of boilers, which rating should be called "National Association Rating." This was to be a rating which the manufacturers would stand back of and guarantee, and was to be based on the following conditions:

First, that it shall not be necessary to fire the boiler more often than once in eight hours to carry its rated load continuously.

Second, That coal used shall contain not

less than 12,000 B.T.U. per pound of coal as fired.

Third, that boiler ratings shall be based on a condensation of 0.30 of a pound of steam per hour per square foot of direct cast-iron radiating surface.

Fourth, that the area of the vertical smoke flue and its height shall be great enough to provide a sufficient draft.

All of these ratings should be conspicuously shown and referred to in catalogues as "National Association Ratings."

It will be noted that the resolution adopted by the boiler manufacturers makes no mention of how the rating shall be known, but the committee on standardization, in commenting on the resolution, states that it "believes the association is to be congratulated on the outcome of this movement to standardize house heating boilers, which should result in great benefit not only to the users of the boilers but to our members, and all other master steam fitters as well." The committee further states that "the association should by vote accept this rating which is practically in accord with our own suggestions. While this communication from the National Boiler and Radiator Manufacturers' Association limits house heating boilers to 2,000 sq. ft. steam carrying capacity, your committee notes with great pleasure that the leading manufacturers are applying this same method of calculating boiler capacities to larger sizes of cast iron boilers."

New Boiler Rules in Nashville, Tenn.

The Smoke Inspection Department of Nashville, Tenn., has recently adopted a set of rules prescribing the size stacks to be used with fire-box heating boilers, including cast-iron sectional boilers, and regarding the installation of these boilers in general. These rules are as follows:

1. In all fire-box boilers up to 1,500 sq. ft. capacity coke or coal with less than 20% volatile matter must be used.

2. All fire-box boilers above 1,500 sq. ft. rated capacity must be provided with down-draft furnaces.

STACK SIZES.

3. All boilers up to 500 sq. ft., 9 in. x 9 in. x 40 ft.

500 to 1,000, 12 in. x 12 in. x 45 ft.
1,000 to 1,500, 12 in. x 12 in. x 50 ft.
1,500 to 2,500, 16 in. x 16 in. x 60 ft.
2,500 to 3,000, 20 in. x 20 in. x 60 ft.
3,000 to 3,500, 20 in. x 20 in. x 65 ft.
3,500 to 3,800, 20 in. x 20 in. x 70 ft.
3,500 to 4,200, 20 in. x 20 in. x 75 ft.
4,200 to 6,500, 24 in. x 24 in. x 75 ft.
6,500 to 8,750, 24 in. x 24 in. x 80 ft.
8,750 to 10,000, 28 in. x 28 in. x 80 ft.
10,000 to 10,500, 32 in. x 32 in. x 80 ft.
10,500 to 13,000, 32 in. x 32 in. x 90 ft.
13,000 to 14,000, 36 in. x 36 in. x 90 ft.
14,000 to 14,500, 36 in. x 36 in. x 95 ft.
14,500 to 15,000, 36 in. x 36 in. x 100 ft.

4. The above stack sizes are for boilers which are set not over 10 ft. from the stack, counting from center of stack to back of boiler, and allow for only one right angle turn in the smoke connection; for each additional right angle turn add 10 ft. to the height of the stack.

5. These sizes are for cases where only one boiler is connected to the stack, and where there are no openings in the stack for other purposes.

6. Where more than one boiler is used, or where other apparatus is connected to the stack, each case will be passed on separately.

7. In all cases stacks must be carried above the topmost story of the building.

8. The top of all stacks must be at least 12 ft. higher than the roof of any building within 50 ft. of the stack.

9. Every stack not directly connected must have a clean-out door at its base at least 24 in. square. A stack less than 24 in. square must have a clean-out door of the same area as the cross-sectional area of the stack.

Current Heating and Ventilating Literature.

Under this heading is published each month an index of the important articles on the subject of heating and ventilation that have appeared in the columns of our contemporaries. Copies of any of the journals containing the article mentioned may be obtained from THE HEATING AND VENTILATING MAGAZINE *on receipt of the stated price.*

HEAT PROBLEMS—

Elementary Heat Problems. Angus Sinclair. Brief explanation of the dynamic theory of heat and method of measuring heat. 2,000 w. Ry & Loc Engng—May, 1914. 40c.

ISOLATED PLANT—

Serving a State Institution. Illustrated description of the mechanical and electrical plant for the Indiana School for Feeble Minded Youths. 1,700 w. Prac Engr, Chicago—May 15, 1914. 20c.

RADIATION—

Calculating Radiation for Steam and Hot-Water Heating. Charles L. Hubbard. Compares the efficiency of direct and indirect radiation, explaining how to determine the proper amount of surface with each. 1,500 w. Power—May 26, 1914. 20c.

SCHOOLS—

The Heating and Ventilation of Bushwick High School, Borough of Brooklyn, New York City. Brief illustrated description of plant for a large high school building, including manual training equipment. 1,500 w. Am Archt—April 29, 1914. 40c.

The Heating and Ventilation of Technical and Trade Schools. Charles L. Hubbard. Discusses the requirements of rooms needing

special treatment. Illus. 2,500 w. Am Archt —May 27, 1914. 40c.

VACUUM CLEANING—

Tests of Vacuum Cleaning Systems. J. R. McColl. Abstract of paper with discussion. 3,000 w. Jour Am Soc of Mech Engrs—May, 1914. 40c.

CORRESPONDENCE

Amount of Air Exhausted by Fans.

EDITOR HEATING AND VENTILATING MAGAZINE:

In reading over my article, as printed in the March number of THE HEATING AND VENTILATING MAGAZINE, one expression in the "Notes on Accompanying Table," page 23, struck me as not quite clear enough, and I find that you "followed your copy."

This is in relation to the amount of air exhausted by fans, and while it would doubtless be understood by experienced heating and ventilating engineers, should be made so that it could not be mistaken, nor be difficult of understanding.

The second sentence in paragraph 3 of those "Notes" should read as follows: "This amount is usually determined by assuming a certain number of square feet of floor space per person, varying according to use of rooms, as given in the first column below, and providing for the removal of the number of cubic feet of air per hour per person as given in the second column, and, of course, this same amount must be supplied, as well as exhausted.

"Some of this air required to be exhausted will leak out around windows, doors, etc. Under average conditions we may assume a leakage space equal to 1/16 in. wide by the periphery in feet of the windows and doors. Reducing all factors, leakage in cubic feet per hour, at a velocity of entering air of, say, 300 ft. per minute, equals the periphery in feet multiplied by 93.75. Leakage will also occur on opening outside doors, varying widely according to conditions, say 20 to 100 cu. ft. at a time. The amount of leakage may be considered as lessening the duty of the exhaust fan."

VENTILATION REQUIRED.

	Sq. Ft. Floor Per Person.	Cu. Ft. Air Per Hour Per Person.
Offices	50	1,800
Restaurants	20	1,800
Court and Legislative Rooms	15-20	2,000
Waiting Rooms	30	1,800
Drug Stores	35	1,800
Depot Stores	10	1,800
Toilets	15	1,800
Schools	18	1,800-2,000
Churches	15	1,500-1,800
Theatres, etc.	15	1,500-1,800
Residences	100	1,800
Hospitals	60	4,000
Hospitals, Contagious	60	6,000

Trusting that this will make this point a little clearer, I am, Yours respectfully,

AMZI T. ROGERS.

Port Richmond, L. I., July, 1914.

Error in Radiation Formula.

EDITOR HEATING AND VENTILATING MAGAZINE:

In your July issue, page 21, second column in the middle, I note an error which I would thank you to correct. The formula for radiation should be as follows:

$$R = 0.33\ G + 0.08\ W + 0.006\ V,$$

in which G is the square feet of glass surface, W the square feet of net exposed wall surface and V is the cubic feet of contents. You will note that the constant is one-third of the glass and not one and three-tenths.

J. BYERS HOLBROOK.

New York, July, 1914.

Death of Edward B. Denny.

News of the death of Edward B. Denny, until recently president of the National Association of Master Steam and Hot Water Fitters, came as a shock to the entire heating trade in which he was widely known as one of its leading figures. The fact that he had only the month before presided at the annual convention of the association in Atlantic City only added to the suddenness of the sad intelligence. Mr. Denny's death occurred July 12, at the home of his niece in Newark, N. J. His family had gone to his country home in New Hampshire and he was preparing to follow them when he was stricken with acute indigestion and heart disease.

During his incumbency of the office of president of the master steam fitters' association, Mr. Denny had traveled from coast to coast in the interests of the association and had made a host of acquaintances and friends. As a result of his efforts, the membership of the association was practically doubled during his term of office, and his administrations were recognized as among the most successful in the history of the organization.

Mr. Denny was a member of the heating and contracting firm of Denny Bros., Newark, N. J., and had long been identified with the trade. He was born in New York in 1848.

Funeral services were held July 15 at the home of his brother, John W. Denny, in Newark. The many floral offerings were notable as indicating the high esteem in which Mr. Denny was held, and many telegrams of

condolence were received from different State associations. The offering of the National Association of Master Steam and Hot Water Fitters was a handsome blanket of white roses and purple orchids. Those present at the funeral included many men prominent in both the heating and plumbing trades.

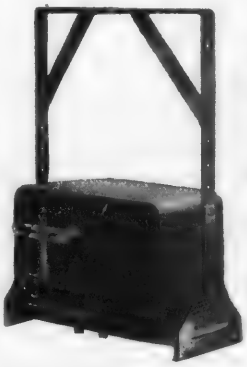
NEW DEVICES

New Type of Thermostat.

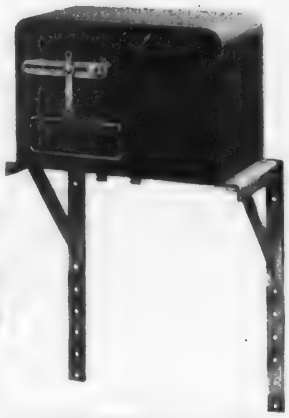
A new automatic time thermostat that not only sets up in the morning, but automatically sets back at night to any predetermined temperatures has lately been brought out by the Honeywell Heating Specialty Co., Wabash, Ind. Through the construction of this device, the only attention that is necessary is to wind the clock once a week. As a rule, the ordinary thermostat is actuated by a clock having an alarm movement. Such instruments are set back by hand every night when lower temperatures are desired, the alarm movement serving to set up the thermostat in the morning. The clocks on all such instruments are wound and set each night.

HONEYWELL TEMPERATURE REGULATOR.

The Honeywell thermostat was designed by M. C. Honeywell. Fig. 1 shows a three-quarter view of the new instrument. The dial is 2¼ in. in diameter, of white porcelain. The clock is wound from the front, the sash or crystal being easily removed. Projecting through the rear of the clock case is a shaft bearing a set of cams that revolve once in twenty-four hours. The revolving of these



New spring motor with combination bracket hangers connected for suspending motor from basement ceiling.



Arrangement for supporting Thermostat on wall.

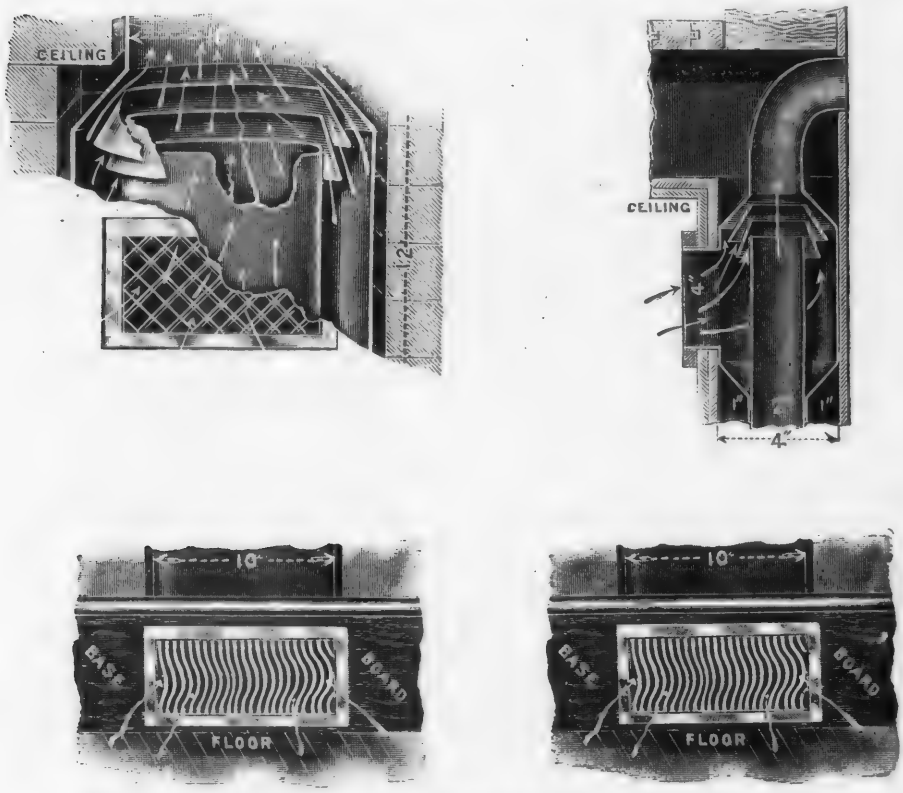
cams controls the blade of the thermostat. The cams can be easily and quickly adjusted to set back the thermostat each day at any desired hour between noon and midnight, and automatically set it up at any hour thereafter until noon of the following day.

The thermostat can be operated as a plain or clock pattern. In disconnecting from the clock, the knurled button below the scale is pulled out. Then the instrument can be set at any temperature between 55° and 85° F., where it will remain as long as wanted. To reconnect the clock, the button is pushed in, after which the clock will have complete control of the instrument.

This device is furnished, when desired, with the company's regular pattern silent operating motor, fitted with automatic cut-out switch, which makes it impossible for the thermostat to run down and have the draft doors open. The Honeywell temperature regulators (Model 8) are listed at $50.00. They are described in detail in a newly-issued catalogue published by the company. Size 3½x6 in. (standard). Pp. 16.

Multiple Room Ventilators.

Something new in the way of a room ventilator has been developed by Merritt G. Griswold, Highwood, N. J., and 79 Murray Street, New York, which is designed to draw out the air from rooms by natural suction. The ventilators with registers at both the floor and ceiling levels are located in channels provided by the builder in the side walls. These channels must start from the floor, be 12 in. wide and 4 in. deep and go up straight to and above the ceiling to any point outside, but preferably out under the eaves, or up through the roof. At a point in the ventilator near the ceiling level is set an "ejector head," inside of which, as will be seen from the illustration, are several inclined flanges just above



ARRANGEMENT OF GRISWOLD'S "MULTIPLE" ROOM VENTILATORS.

and surrounding the pipe. As the warm, vitiated air at the ceiling enters the "ejector head," and passes up between the flanges, it is divided into jets that impinge against all sides of the foul air pipe. These "ejector heads" are designed to act as suction devices pulling up the air through the floor registers, each jet giving the moving air another push. One "multiple" room ventilator, it is estimated, will take care of 1,500 cu. ft. of space.

New Automatic Vacuum Valve.

Frank A. Simonds, Grand Rapids, Mich., for many years connected with the Simonds Heating & Specialty Co., has recently perfected a new automatic vacuum valve, for use in heating work. It is known as the F. A. S. vacuum valve. Mr. Simonds has lately completed steam heating plans for a group of greenhouses in eastern Ohio in which over 12 miles of pipe will be used in the heating coils alone.

"Front Rank" Humidifier.

A type of warm air furnace humidifier consisting of a supply tank and vapor tank in connection with a water back placed in the furnace has been placed on the market by Haynes-Langenberg Mfg. Co., St. Louis, Mo. The waterback is set in the place of one of the fire brick linings. Connection to the vapor

"FRONT RANK" HUMIDIFIER.

tank is made by a flow and return pipe. When the water in the water back becomes heated it causes the water in the vapor tank to turn into steam. The steam flows through the pipe leading from the top of the vapor tank

to a point above the crown of the furnace. There the steam mingles with the hot air and is thus distributed to the rooms. This apparatus, it is stated, will automatically regulate the amount of steam furnished to the air.

Gold Temperature Regulating System.

A new system for regulating the temperature in buildings, designed to be operated entirely from the lighting circuit, has been brought out by the Gold Car Heating and Lighting Co., 17 Battery Place, New York. With this arrangement, no compressed air or expensive installation is necessary. The thermostat consists of two special devices, including an electric thermostat operating contacts by the expansion and contraction of a temperature sensitive diaphragm, placed on the wall of the room, and a special electromagnetic valve which takes the place of the ordinary inlet valve on the radiator. The valve and thermostat are connected by electric wires, the operating current being obtained from the electric lighting circuit.

The operation of the thermostat is effected by a metal diaphragm capable of expanding and contracting. Within this diaphragm is sealed a small amount of a volatile liquid which

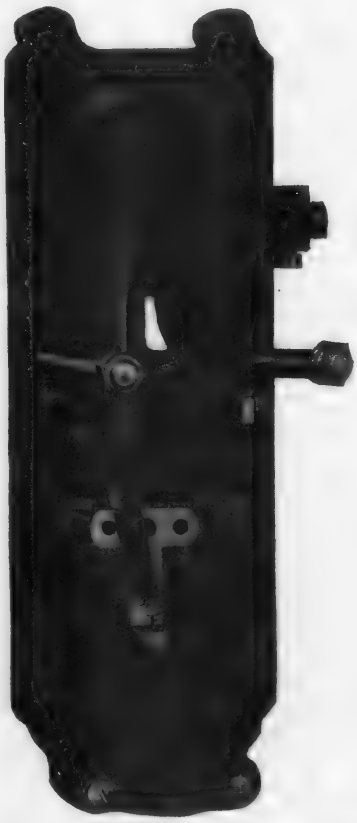


FIG. 2.—INTERIOR VIEW OF GOLD'S ELECTRIC THERMOSTAT.

expands by the heat by vaporizing and contracts by condensing. The expansion and contraction of the diaphragm actuates a metal strip which opens or closes the circuit, as the case may be. This action operates the magnetic valve or valves which are connected to the radiators. The thermostats are so made that a range of 10° can be obtained by moving the thumb screw on the side of the thermostat. A switch with lock attachment is furnished, when desired, for cutting the current off the thermostat during the season when heat is not required.

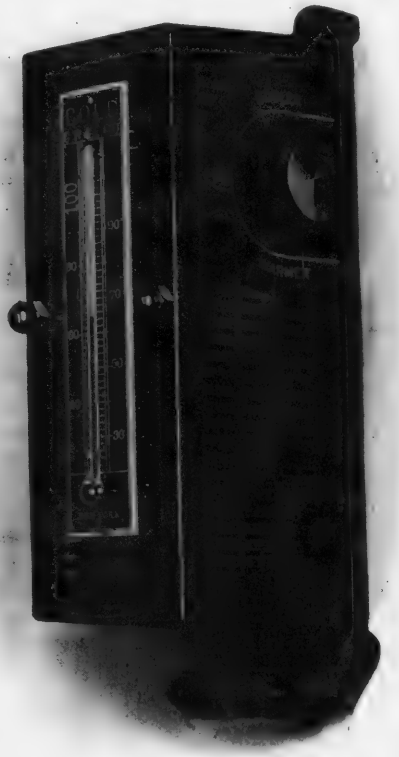


FIG. 1.—GOLD THERMOSTAT, SHOWING METHOD OF ADJUSTMENT TO ANY DESIRED TEMPERATURE.

Trade Literature.

IDEAL HEATING JOURNAL for July, 1914, the periodical of the American Radiator Co., Chicago, contains an interesting chart, based on data collected by the company, showing the coal consumed during the heating season for any given locality, with different-sized heating systems. This number also contains the first part of a carefully-prepared article on "Chimney Draft Formulas." Illustrations and descriptive matter are presented of the new $150 Arco Wand vacuum cleaner.

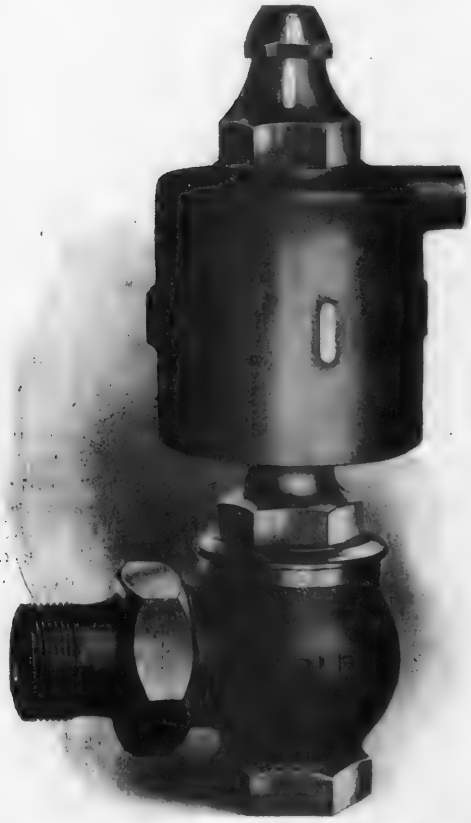
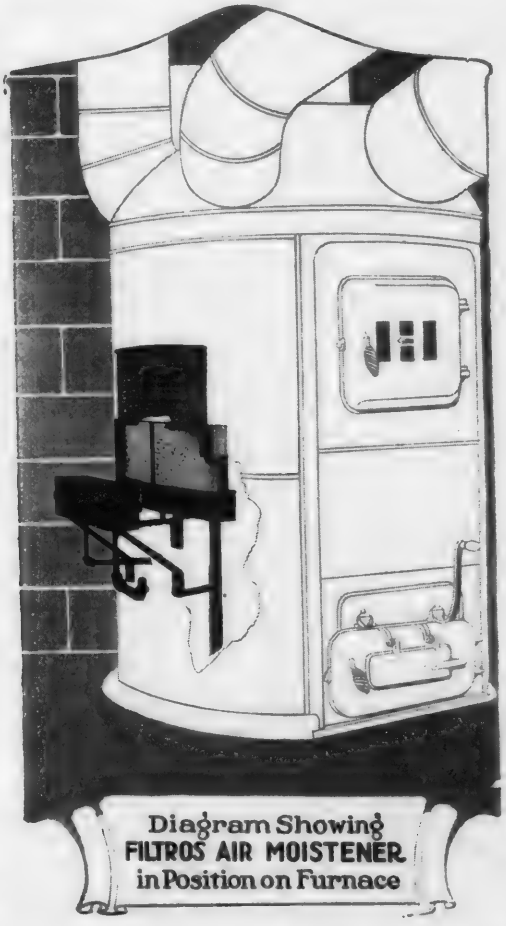
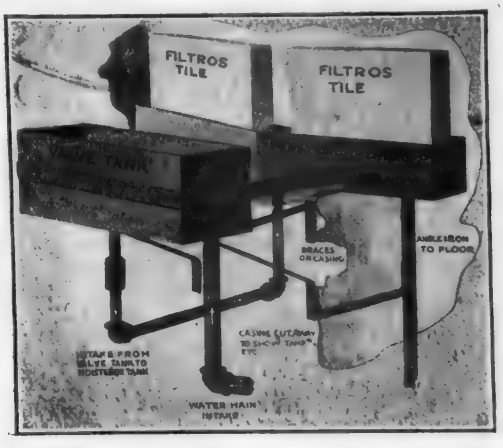


FIG. 3—ELECTRO-MAGNETIC VALVE OPERATED BY GOLD'S THERMOSTAT.

HUMIDITY—ITS NECESSITY TO THE HOME is the title of a timely catalogue devoted to the Filtros air moistener, intended for use with warm-air furnaces and made by the General Filtration Co., Inc., Rochester, N. Y. This device is in line with the more scientific efforts that are now being made to overcome the excessive dryness of furnace heat. The Filtros air moistener consists of two porous silica "Filtros" plates, installed vertically inside the furnace casing. The principle of the moistener is based upon the great capillary power of the "Filtros" plates. These plates, it is stated, will take up water and become completely saturated as quickly as a lump of sugar. The entire surface of the plates, therefore, becomes immediately a rapid evaporating surface in direct contact with the heated air. The smallest Filtros moistener has an evaporating area of over 300 sq. in. Water is supplied automatically from the house water system. In a letter from a user, the statement is made that the device on the first day of its installation raised the relative humidity of the indoor air from 27% to 45% and, at times, to over 50%. The apparatus is listed at $40.00. Size 3½x6 in. Pp. 16.





FILTROS AIR MOISTENER.

INSTALLATIONS—DUNHAM SYSTEMS OF HEATING is the title of an impressive catalogue issued by the C. A. Dunham Co., Marshalltown, Ia., devoted entirely to illustrations of buildings in which the Dunham system is installed. The list leads off with the Wool-

worth Building, in New York, and includes such representative structures as the Union Central Life Building, Cincinnati; Woodmen of the World Building, Omaha; Waldheim Building, Kansas City; Equitable Building, Des Moines; Salt Lake City High School, etc. In the full list almost every section of the country is represented, showing how widely this system is in use. Size 6x9 in. (standard). Pp. 40.

BEACH-RUSS PATENTED VACUUM PUMPS for return line vacuum heating systems are featured in a new circular (Bulletin 17) issued by the Beach-Russ Co., 220 Broadway, New York. The point is emphasized that these pumps have no intricate parts, so that there is nothing to wear out, thus practically eliminating repairs. These pumps are made in six sizes, with capacities in gallons per hour from 5,200 to 40,200, and in square feet of radiation from 5,000 to 67,000 sq. ft.

DRY KILNS FOR TIMBER PRODUCTS is the subject of an exhaustive catalogue, profusely illustrated (Bulletin No. 20), published by the American Blower Company, Detroit, Mich. Section 1 takes up natural circulation kilns, including the progressive type and the apartment type, concluding with a detailed description of the drying equipment for this type of kiln. Section 2 is devoted to forced circulation kilns, both of the progressive and apartment types. Typical arrangements are included of veneer dryers, followed by a description of the drying equipment for forced circulation kilns. Section 3 is given over to dry kiln specialties, such as track supports, trucks, traps, door carriers, etc. Size 8½x11 in. Pp. 64.

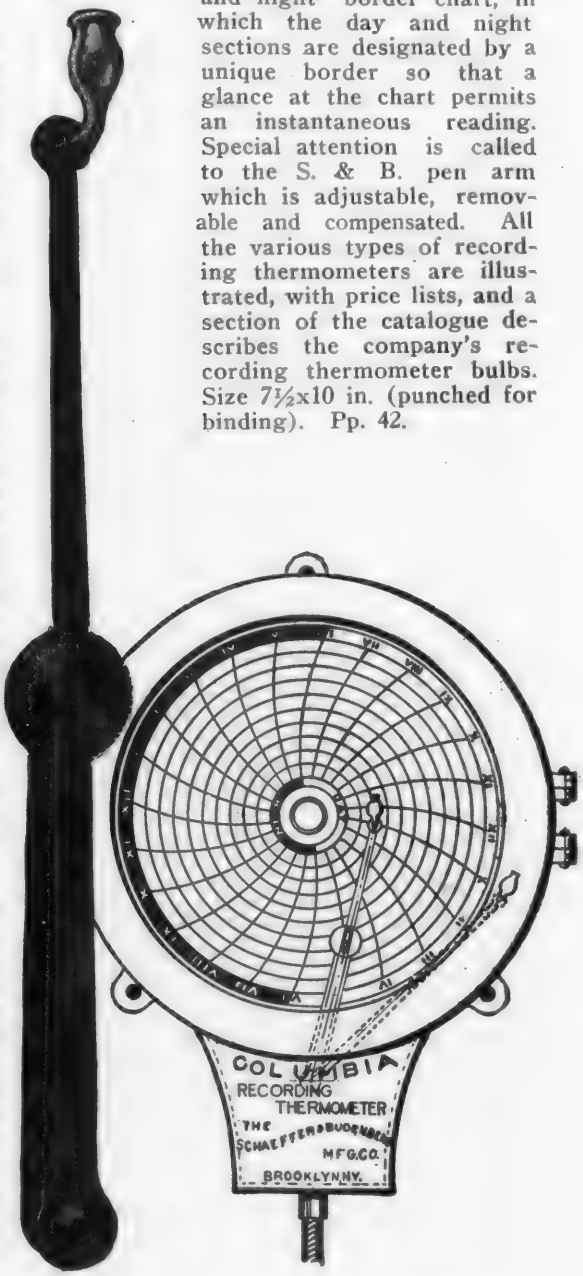
DETROIT PACKLESS RADIATOR VALVES, made by the Detroit Lubricator Co., Detroit, Mich., are concisely described in recently-issued circulars, showing their construction in detail.

N. T. C. IRON BODY BRASS MOUNTED WEDGE GATE VALVES, made by the National Tube Co., Pittsburgh, Pa., in sizes from 2 in. to 24 in., inclusive, are the subject of an elaborate catalogue (Bulletin 13 A). The company states that the demand for this bulletin necessitated the printing of a second edition. The company states that a copy of this and of all other "National" bulletins will be forwarded to our readers upon request. Size 8½x11 in. Pp. 12.

TURBO UNDERGRATE BLOWERS, made by the B. F. Sturtevant Co., Hyde Park, Mass., are brought to the attention of the trade in newly-prepared circulars.

VALVE WORLD for July, 1914, published by the Crane Co., Chicago, Ill., contains, among other things, the third of a series of articles on pop safety valves, dealing especially with the development of the huddling or poping chamber.

COLUMBIA RECORDING THERMOMETERS, made by the Schaeffer & Budenberg Mfg. Co., Brooklyn, N. Y., are treated exhaustively in a new catalogue (section 300). An interesting feature of these thermometers is the "day and night" border chart, in which the day and night sections are designated by a unique border so that a glance at the chart permits an instantaneous reading. Special attention is called to the S. & B. pen arm which is adjustable, removable and compensated. All the various types of recording thermometers are illustrated, with price lists, and a section of the catalogue describes the company's recording thermometer bulbs. Size 7½x10 in. (punched for binding). Pp. 42.



THE S. & B. ADJUSTABLE AND REMOVABLE PEN ARM AND HOW IT IS MOVED ASIDE PREPARATORY TO CHANGING CHART.

THE COMPLETE LINE of Capitol Boilers and United States Radiators are the subject of a new catalogue published by the United States Radiator Corporation, Detroit, Mich. The catalogue also includes full price lists and other data regarding the Capitol vacuum cleaners. Another section is devoted to various types of radiator valves and a variety of heating specialties, the whole bringing into compact form the information desired by the heating man. The company states that it "absolutely guarantees the published capacities of Capitol boilers in pounds of steam at the boiler outlet, provided that the area of the vertical smoke flue and its height shall be great enough to provide a sufficient draft to consume with proper combustion the required amount of fuel per hour, and the best grades of anthracite coal are used." The basis of the ratings are given in detail in the catalogue. Size, 4½x7½ in. Pp. 208.

New Receiver for Kellogg-Mackay Company.

Clarence V. Kellogg, Chicago, has been appointed receiver for the Kellogg-Mackay Co., Chicago, taking the place made vacant by the death of the former receiver, Fred A. Busse.

George D. Howell, formerly vice-president of the McCrum-Howell Co., New York, in a decision handed down by the U. S. Circuit Court, has been held liable for $2,229,935 in notes which he endorsed for this firm, whose failure occurred in 1912. This decision reverses a decision of the U. S. Circuit Court.

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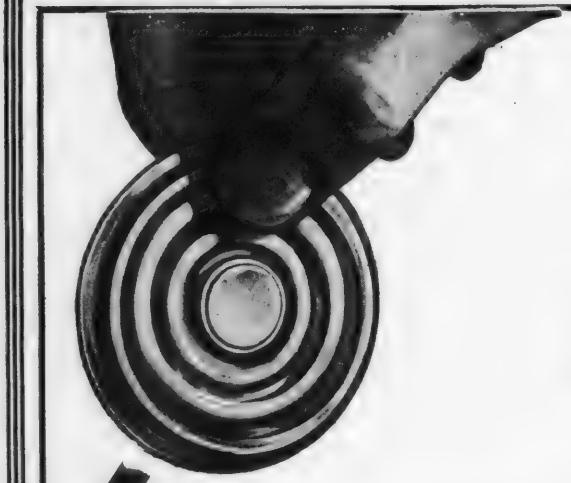
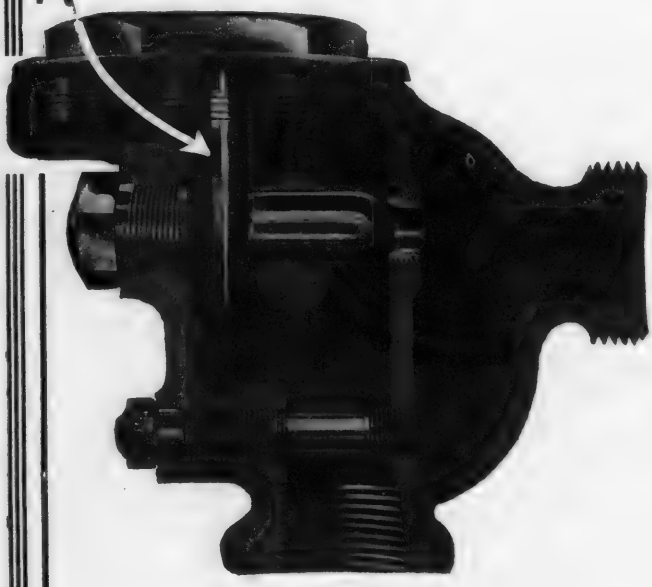


100% Efficient

This Thermostatic diaphragm dropped into the Monash Thermostatic Valve does the work



U. S. Patent, April 28, 1914

This valve has a loose thermostat which is not attached to the cover or body of the valve and **requires no adjustment.**

It has a spring bumper to take care of the over-expansion of the thermostat and prevent its collapse or rupture.

MONASH THERMOSTATIC RETURN LINE VALVE

for

Vacuum Heating Systems

For further information address

MONASH ENGINEERING COMPANY

1420 W. Jackson Blvd. **Chicago**

121 W. 42nd St. **New York**

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TRADE AND MISCELLANEOUS NOTES

Deaths.

Quimby N. Evans, senior partner of the firm of Evans, Almirall & Company, engineers and contractors for heating, ventilating and power plants, died suddenly July 6. Mr. Evans was one of the pioneers in the heating business in this country, having been in partnership with Frederick Tudor of Boston, under the firm name of F. Tudor & Co., in the '70s. In 1880 he formed a partnership as The Q. N. Evans Co., doing business in Boston and New York. In 1892, Mr. Almirall became associated with him and, a couple of years later, the present co-partnership of Evans, Almiral & Co. was formed. During the past two years Mr. Evans had not been actively engaged in the business, having felt that he could leave it in younger hands. His death was quite unexpected. The business of Evans, Admirall & Co., it is announced, will continue as in the past.

Mr. Evans, who was 66 years old, leaves a widow and two sons, one of whom is Ira N. Evans, the well-known heating and ventilating engineer.

Walter N. Foss, sales representative for the Kelsey Heating Co., Syracuse, N. Y., was killed June 26, while on a business trip through Vermont by being thrown out of an automobile. He was 52 years old.

Miscellaneous Notes.

Harry F. Bowers, vacuum heating expert, for the past 23 years with Warren Webster & Co., at Boston, has resigned his position.

E. C. Molby, formerly eastern manager for Pierce, Butler & Pierce Mfg. Co., who has recently taken up the sale of the Surrell down-draft boilers, has issued an announcement to the trade in which he states that "having carefully investigated the principles of combustion, and their application as represented in the construction of this boiler, I am convinced that the future boiler business of the country depends upon the adoption of a boiler embodying these principles, and that the Surrell construction is perfect in principle, perfect in application, and entirely satisfactory as to operation and economy in actual practice." Mr. Molby's headquarters are at 39-41 Cortlandt St., New York. Further announcement is made that hereafter the Surrell boiler will be known as the Molby heater and that the business will be conducted under the name of E. C. Molby.

G. K. MacEdward, advertising manager of the Detroit Lubricator Co., Detroit, Mich., has resigned to join the advertising department of the Chalmers Motor Co.

Pasadena, Calif.—Work will commence shortly on the new central heating plant to be installed in the Boston Block by B. O. Kendall and associates. This plant will furnish heat and hot water to several of the Kendall buildings, the pipes reaching as far north as the new building being built for the Pasadena Furniture and Carpet Co.

Barbour Plumbing, Heating and Electric Co., Birmingham, Ala., suffered a loss of $60,000 through a fire which visited its plant July 5.

Genuine Armstrong Stocks and Dies

MALLEABLE HINGED PIPE VISES

PIPE CUTTERS

PIPE MACHINES, HAND OR POWER

The Tools of Constant Service

Manufactured by — Write for Catalog

THE ARMSTRONG MFG. CO., 321 Knowlton St., BRIDGEPORT, CONN.

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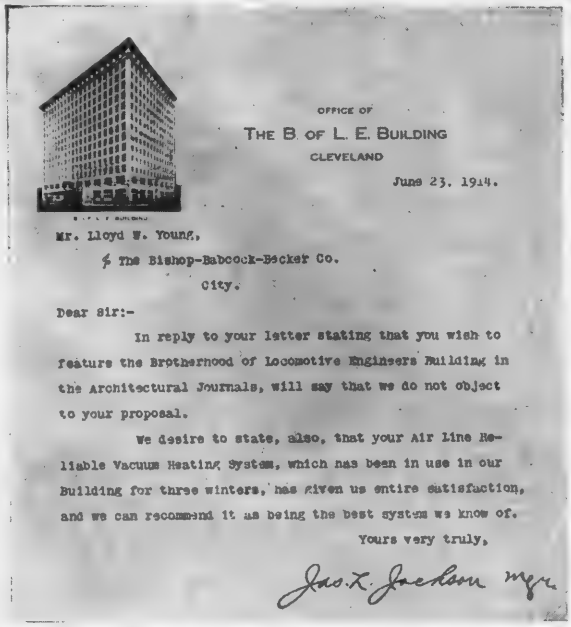
Urbauer-Atwood Heating Co., St. Louis, Mo., has purchased a lot on Eleventh Street, south of Walnut Street, with a frontage of 50 ft. The purchase price was $10,000. The lot is immediately back of the property occupied by the company and will be used for an extension of the company's plant, or held for a rise in value.

Saginaw, Mich.—Work is progressing rapidly on the new central station heating system in Saginaw and General Manager John D. Harris of the Saginaw Heating Company, which will operate the system, states that he expects the work will be finished by September 15, as specified in the franchise. It is also stated that applications for the new company's service are coming in in large numbers and that the system will have all the customers it can serve by the opening of the heating season.

Prof. John R. Allen, Ann Arbor, Mich., has been retained as consulting engineer for the Idaho-Oregon Light & Power Co., at the Ox-Bow Bend of the Snake River and will supervise the installation of the largest silent chain drive in the world. The eight transmission chains weigh 22,000 lbs. and are 14 ft. wide, transmitting 5,000 h.p. When the enterprise is completed the plant will have a capacity of 40,000 h.p. and will cost $5,000,000. Prof. Allen is now in Idaho, where he went directly after the summer meeting of the heating engineers' society in Cleveland.

San Francisco, Cal.—The city attorney has advised the Board of Supervisors that it has the right to prescribe the conditions under which steam mains may be laid in the streets, the quality and location of the pipes and appliances used, as well as the character of the service, and that it has power to fix rates annually for steam heat service. No franchise rights for laying steam mains in the streets have been granted, the city attorney says, and the electric light companies, which are engaged in the steam heating business, have been putting down such mains under special permits from the supervisors and the board of works. The matter was brought to the attention of the supervisors by the Universal Gas and Electric Company, which complained that some of its competitors were using the steam heat adjunct of their business to increase their sales of electric current, steam heat being supplied by these companies only to parties who brought electricity for light or


OFFICE OF
THE B. OF L. E. BUILDING
CLEVELAND

June 23, 1914.

Mr. Lloyd W. Young,
℄ The Bishop-Babcock-Becker Co.
City.

Dear Sir:-

In reply to your letter stating that you wish to feature the Brotherhood of Locomotive Engineers Building in the Architectural Journals, will say that we do not object to your proposal.

We desire to state, also, that your Air Line Reliable Vacuum Heating System, which has been in use in our Building for three winters, has given us entire satisfaction, and we can recommend it as being the best system we know of.

Yours very truly,

Jas. L. Jackson Mgr.

Read this letter

from the manager of this modern office building—one of the largest and finest in the World. The Reliable Vacuum Heating System has given entire satisfaction because it insures even heat distribution, instant results and great fuel saving. The system is noiseless; and there is no vapor escape; no leaky radiator valves; no odors or gases; no adjustments necessary.

RELIABLE
VACUUM HEATING SYSTEMS

are giving just as good results in hundreds of other buildings of all kinds, large and small, throughout the country.

Our catalog explains why these results are possible. Write for a copy, today, of Booklet "K."

THE BISHOP-BABCOCK-BECKER COMPANY

General Offices: CLEVELAND, O.

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power from them. The Universal Company contended that the supervisors should prescribe rates for steam heat, so that the public might obtain this service without being obliged to purchase light or power from the corporation supplying it. Such rates have never been fixed there. The Universal Company stated that the light and power concerns which did not have a steam heat plant as an adjunct of their business were at a disadvantage under existing conditions.

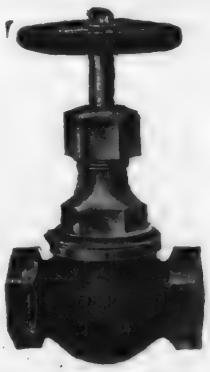
Galesburg, Ill.—E. G. Cox, Galesburg, has been appointed designing engineer for the heating plant for the county court house and jail at Galesburg. Mr. Cox recently planned the heating equipment for Knox College. The court house installation, it is estimated, will cost $10,000.

Salt Lake City, Utah.—Dooly Building Power Company has applied to the city commission for a franchise to extend its central station heating system. While the franchise as sought refers to the entire city, it is explained in an accompanying letter that the company intends only to extend its service in the general vicinity of its plant. The Dooly plant now supplies nearly every building in the block bounded by West Temple, First West, Second South and Pierpont Streets. This district is building up rapidly, it is stated, and many demands for connections have been received by the company.

Burlington, Ia.—While no definite action has yet been taken regarding the discontinuance of the central station steam heating system in Burlington, owing to the fact that the electric light and power formerly furnished by this plant is now obtained from the water power at Keokuk, the probabilities are that the system will be abandoned. Such action will necessitate the installation of over 80 separate heating plants.

Tacoma, Wash.—Superior Judge Easterday has handed down a decision in favor of the city in the suit of the Tacoma Central Heating Company against the city, by sustaining a demurrer to the complaint of the heating company. The company asks for a permanent restraining order to prevent the city officials from considering the rescinding the heating franchise granted to the company, as demanded in petitions circulated in Tacoma. The demurrer came up on a motion for an order to show cause why a permanent restraining order asked by the company should not be granted. The contention of Attorneys Stiles and Carnahan for the city was that allegations in the complaint did not constitute a cause of action. This contention was sustained by Judge Easterday, who granted the company's attorney 10 days in which to file an amended complaint. The restraining order already made by the court was ordered continued in force until further notice.

Miles City, Mont.—As soon as the new city hall is built a heating plant will be installed which may serve as a nucleus of what may be eventually an extensive sys-



Specify Valves by the Diamond Trade Mark

Because on any valve it means absolute satisfaction, replacement, or money back. It is the mark which enables you to distinguish the *genuine Jenkins Bros. Valves*, known the world over as being the most reliable. All good kinds for all conditions of service. Write for handy catalogue.

JENKINS BROS.

New York Boston Philadelphia Chicago Montreal London

SPECIFY FOXBORO THERMOMETERS

TRADE MARK

THE LATEST AND BEST BY EVERY TEST

Send for Bulletin No. 73

New York 50 Church St. **The Industrial Instrument Co., Foxboro, Mass.** Chicago Monadnock Bldg

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tem of municipal heating from the city power station. City Engineer Pruett calculates that 120,000 sq. ft. of radiation surface can be supplied from the city power plant which would be sufficient to heat the entire business district.

American Boiler Manufacturers' Association will hold its next annual convention at the Waldorf-Astoria Hotel, New York, September 1-4, 1914.

Andrew G. Paul, of the Andrew G. Paul Co., Boston, Mass., manufacturer of heating specialties, is recuperating from a prolonged illness.

Chicago Association of Master Steam Fitters, at its annual meeting in Chicago, June 23, elected the following officers: President, William Lees; vice-president, F. W. Lamb; secretary, Frank J. Douglass; treasurer, W. A. Pope. A dinner followed the meeting, 85 diners being present. The membership list, it was reported, has been increased from 22 to 101 during the past year. A credit exchange bureau has been adopted and will be under the supervision of a technical committee. The association now has under consideration the adoption of a uniform contract form.

Manufacturers' Notes.

C. A. Dunham Co., Marshalltown, Ia., manufacturers of the Dunham steam trap and vacuum heating specialties, it is reported, is considering the removal of its plant to Youngstown, O.

Hutchison Vapor Heating Corporation, Herndon, Va., has opened a branch office in Washington, D. C.

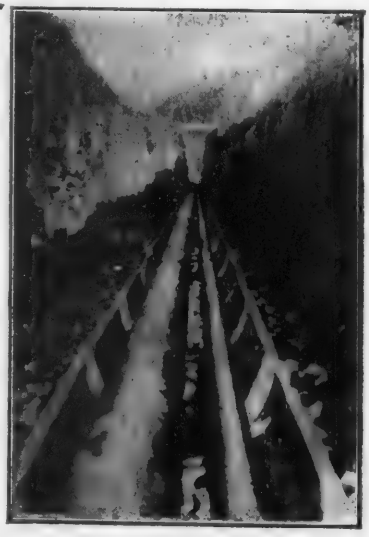
Richardson & Boynton Co., New York, whose boiler and radiator plant at Dover, N. J., was damaged by fire June 28, reports that the buildings destroyed were its foundry No. 1 and the sheet metal shop. The company's warehouses were not injured. Foundry No. 2 is now being operated with a double shift of men and a temporary sheet metal shop has been built, pending the reconstruction of the burned buildings. The company states that the prompt filling of orders has not been interfered with.

Uhrichsville, O.—The Denison foundry at Uhrichsville has been purchased at receiver's sale by W. K. Eckfeld, for $11,700 and it is announced that the plant will be operated by a new company for the manufacture of steam and hot water radiators. The plant is already equipped with the necessary machinery.

Buildings of Boston State Hospital

Heated from central power plant through

J-M SECTIONAL CONDUIT



THIS is a practical installation of approximately 9,000 ft. of J-M Sectional Conduit installed to do away with individual heating plants and one group plant. Many unusual conditions were encountered and met here.

This installation does away with separate heating systems in many buildings with all their extra labor, insurance and fuel—to say nothing of the dirt, noise, inconvenience and incidental annoyances having been entirely obviated by our system of carrying the exhaust or live steam underground.

J-M Sectional Conduit, being made of extra heavy deep and wide socket special tile, salt-glazed inside and out, never deteriorates. Carries steam thousands of feet from central power plant with the highest practical efficiency. Properly installed it is water-tight; gas-tight, fire, acid, oil and chemical proof. Can be taken up and relaid without injury.

Our experience in this line of work, gained by actual installations in hundreds of plants, will help you and prevent the making of mistakes that others have made.

J-M Sectional Conduit is the most efficient, economical and durable underground steam pipe insulation on the market.

Write nearest Branch for particulars and Catalog No. 112.

H. W. JOHNS-MANVILLE CO.

Albany, Baltimore, Boston, Buffalo, Chicago, Cincinnati, Cleveland, Dallas, Detroit, Indianapolis, Kansas City, Los Angeles, Louisville, Milwaukee, Minneapolis, New Orleans, New York, Omaha, Philadelphia, Pittsburgh, San Francisco, Seattle, St. Louis, Syracuse

2423

Please mention THE HEATING AND VENTILATING MAGAZINE *when you write.*

Little Drops of Water

Ordinary radiator valves with stuffing boxes are a constant source of damage, annoyance and expense.

Sooner or later valves of this type are sure to leak around the stem. It is unusual to find a building where valves of the packed variety are installed where leakage has not done some damage.

Spoiled floors, stained and discolored walls and ceilings, loose plaster, spotted decorations, furniture and rugs—these are some of the most common evidences of the use of cheap valves.

Detroit Packless Radiator Valves are absolute insurance against such troubles on all kinds of steam heating systems.

They are tight—and they always stay tight. They will not leak under any circumstances.

The installation of Detroit Packless Radiator Valves represents an investment that pays big dividends—dividends in satisfaction, in freedom from annoyance and in money saved.

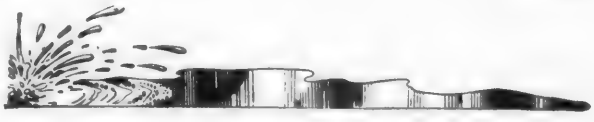
Their first cost is the whole cost. They do not have to be repacked at frequent intervals at considerable expense for labor, and in large buildings there is no necessity of a man devoting a large part of his time to their care.

Complete Information on the subject of radiator valves will gladly be sent upon request. Ask for booklet V-46.

DETROIT LUBRICATOR COMPANY.

DETROIT U.S.A.

CANADIAN DETROIT LUBRICATOR COMPANY, LTD. WALKERVILLE, ONT.



Kelsey Heating Co., Syracuse, N. Y., announces that it has opened an office and salesroom in Chicago at 2767 Lincoln Avenue, with J. P. Moran in charge.

Syracuse Faucet & Valve Co., Syracuse, N. Y., has moved its offices and factory to the third floor of the Industrial Building, 107 North Franklin St., Syracuse.

Clarage Foundry & Mfg. Co., Kalamazoo, Mich., announces the opening of a branch office in New York City, at 149 Broadway, to take care of its eastern sales of fans, engines and other heating and ventilating equipment. The office is in charge of R. B. Bedford, who has been active in the fan and blower branch of the heating and ventilating business for over 10 years.

Pierce, Butler & Pierce Mfg. Co., Syracuse, N. Y., announces the appointment of George W. Crane, as manager of the firm's New York office, succeeding E. C. Molby. Mr. Crane was formerly located at the company's home office in Syracuse.

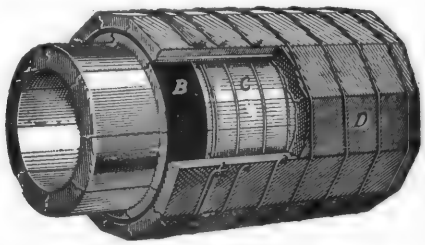
The Bristol Co., Waterbury, Conn., has established a district branch office at Boston, Mass., for the sale of the well-known line of Bristol recording instruments. One of the company's sales engineers, F. H. Emerson, has been appointed Boston district manager and will have his headquarters at the Boston branch office in the Old South Building. This year is the 25th anniversary of the founding of The Bristol Company and the company states that its plant has grown at the rate of doubling the floor space once every five years during the last 20 years. The total sales of Bristol recorders to date amount to 65,000. Several important new lines of instruments, the company announces, will soon be put upon the market.

American Engine & Electric Co., Bound Brook, N. J., has appointed Harry J. Marks sales manager of the company. Mr. Marks was formerly manager of the company's New York Office. He is a member of the American Society of Mechanical Engineers and has had nearly 20 years' active experience in the operation, manufacture, design and sale of steam engines He will divide his time between the company's New York office at 90 West Streeet, and the plant at Bound Brook.

Business Chances.

Washington, D. C.—Sealed proposals will be received at the office of the Supervising Architect, Treasury Department, for the following named work:

Until August 12, 1914, for the construction, complete, including mechanical equip-



A—Inner Shell, 2 inches thick.
B—Asphaltum Packing.
C—Dead Air Space.
D—Outer Shell, 1 inch thick.

Cover Your Steam Pipes

WITH WYCKOFF'S IMPROVED

CYPRESS COVERING

Made of Gulf Cypress, the wood eternal

Not affected by wet and dry conditions common to steampipe trenches. Will not rot. Lasts twice as long as Pine Casing. Absolutely water and steam tight. Each shell is wound with heavy galvanized wire. Coated all over with the best known preservative—Hydrolene B.

Let us answer your questions and tell you all about it. Booklet on request.

A. WYCKOFF & SON COMPANY

ELMIRA . . N. Y.

When they needed More, they Bought

The Kauffman-Baer Building, Pittsburgh, Pa. Starrett & Van Vleck, Architects. 10 units of "Sirocco" Purifiers are installed in this building.

"Sirocco"
TRADE MARK

Purifying — Cooling and Humidifying Systems

The Engineers of the H. W. Oliver estate, owners of the Kauffman-Baer Department Store Building, installed 6 "Sirocco" Outfits in the store building and when they decided to have purified air in the power plant they ordered 4 more.

"Sirocco" Purifiers, Coolers and Humidifiers are designed right and give the desired results—that's why they are bought in **quantities.**

The very latest improvements made in air purifier design and construction are embodied in "Sirocco" machines.

All spray heads can be flushed simultaneously and **without lowering the efficiency of the purifier.**

The bank of mist covers the entire area of the spray chamber, hence no particle of dirt, dust, etc., can possibly pass through the spray chamber without becoming thoroughly saturated with water.

The scrubbing plates (found in no other make) being constantly flooded with water, receive these particles and wash them down into the tank.

Everything pertaining to a "Sirocco" Purifier was designed with the idea of utmost simplicity of operation and to give the best results consuming the least amount of power to do it.

Bulletin No. 2309 gives details. Your request will bring one.

AMERICAN BLOWER COMPANY

DETROIT, MICHIGAN, U.S.A.

Canadian Sirocco Company, Ltd., Windsor, Ont., Manufacturers for Canada.

ment, etc., of the U. S. Post Office at Georgetown, Ky. Two stories and basement, 4,800 sq. ft. ground area.

Until August 14, 1914, for the construction, complete, of the U. S. Appraisers' Stores at Milwaukee, Wis. Two stories and basement, 7,200 sq. ft. ground area.

Until August 22, 1914, for the construction, complete, including mechanical equipment, etc., of the U. S. Post Office and Court House at Medford, Ore. Three stories and basement, 5,500 sq. ft. ground area.

Until August 24, 1914, for the construction, complete, including mechanical equipment, etc., of the U. S. Post Office at Bedford, Pa. One story and basement, 4,720 sq. ft. ground area.

Until August 26, 1914, for the construction, complete, including mechanical equipment, etc., of the U. S. Post Office at Tupelo, Miss. One story, mezzanine and basement, 4,000 sq. ft. ground area.

New Firms.

W. B. Frehsee, Sabetha, Kansas, has opened a heating and plumbing business on East Main Street. Mr. Frehsee was formerly connected with the American District Steam Co.

Union Plumbing & Heating Co., Marysville, O., composed of W. P. O'Brien and F. M. Demarest, has opened its new quarters in the Whitney Building. Charles P. Stann, formerly plumbing inspector of Portsmouth, and R. J. Hearing, of Columbus, will have charge of the firm's work.

New Incorporations.

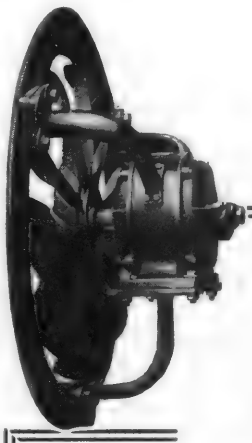
The Ventilation Co., Inc., New York, capital $25,000, to manufacture and deal in ventilating apparatus. Incorporators: H. W. Buxton, Princeton, N. J.; A. Sautz, Jr., and M. B. Koehler, of New York.

Automatic Electric Heating Co., San Francisco, Cal., capital $200,000. Incorporators: J. Ohman, O. C. Edberg, J. E. Seth, E. Ullberg and O. E. Evans.

Manchester Plumbing Supply Co., Manchester, Conn., capital $10,000, to deal in heating and plumbing supplies. Incorporators: Fred T. Bush, Albert G. Hollister and John A. Haling.

James Cunnion & Son, New York, capital $10,000, to manufacture ventilating systems. Directors: Frank P. Cunnion, Arthur Cunnion, 407 East 125th St., New York; Lewis V. Huke, 525 Garden St., Hoboken, N. J.

H. D. Brown Co., Atlantic City, N. J., capital $25,000, to deal in heating and plumbing specialties. Incorporators: Harry D. Brown, D. H. Irwin and J. F. Fox.



Note these special features of

Westinghouse-Ventura Ventilating Fans

The large, central disk of the fan prevents back flow of air at high speeds—which inevitably happens with older types of fans.

The unusually large number of blades permits the use of slow speed motors; hence operation is very quiet.

The special construction of the blades causes the air to be thrown directly ahead instead of being spread out in an expanded cone.

These features taken together mean high efficiency—that is, maximum amount of air moved for given current consumption.

Note also the compactness of the unit, how little the motor will project into the room when the fan is mounted in the wall.

The motor is completely enclosed on all sides. It has ample overload capacity to drive the fan against a strong back pressure of wind.

Publication giving full information, dimensions, prices, etc., sent on request.

Westinghouse Electric & Manufacturing Co.

East Pittsburgh, Pa.

Sturtevant
(REG. U. S. PAT. OFF.)

Service and Sturtevant Fans

To the engineer or contractor designing fan systems for heating, ventilating, collecting, mechanical draft, or for a hundred other applications, Sturtevant Engineers provide a service not equalled by any other fan Company.

The Sturtevant staff comprises the largest corps of trained fan engineers in the world, being located in every principal city in the United States and Canada, always ready to suggest the best methods of meeting requirements. These engineers will gladly assist in laying out fan systems.

To the contractor, the Sturtevant Company offers an apparatus that will meet all requirements of capacity, durability and efficiency. Sturtevant Fans are more ruggedly built than any other fans in the world. They are heavy where weight is necessary for strength and rigidity. They are easy to erect because accurately and strongly built. The side plates will not buckle.

Sturtevant Fans are described in catalog No. 180-V.

B. F. Sturtevant Company

Hyde Park, Boston, Mass. And all other principal cities of the world.

Kauffman Engineering Co., St. Louis, Mo., capital $15,000, to manufacture air conditioning apparatus, vacuum heating specialties, radiator shields, etc. Incorporators: Sam Kauffman, Chester Cook, Harry Juengst and Morris Kauffman.

Mahaska Plumbing & Heating Co., Oskaloosa, Ia. Incorporators: J. H. McCallum and C. S. Higlin.

Treble Engineering Co., Chicago, capital $2,500, to manufacture vacuum and vapor heating valves and specialties. Incorporators: Samuel A. Long, B. L. Willet and Frank P. McGinn.

Victor Ventilating & Engineering Co., Inc., Wilmington, Del., capital $100,000. Incorporators: H. W. Bodine, G. A. Collins, of West Brighton, N. Y.; and E. R. Foote, of Bayonne, N. J.

James T. Hutchinson, Inc., Hackensack, N. J., capital $10,000 to conduct a heating and plumbing business. Incorporators: James T. Hutchinson, Wendell J. Wright, of Hackensack, and M. L. O'Brien, of Elizabeth, N. J.

James Mfg. Co., Canton, O., capital $100,000, to manufacture heating and plumbing goods. Incorporators: C. R. James, G. J. James, B. James, E. D. James and C. G. Herbruck. The new company's plant will be located at Canton.

Baton Rouge Plumbing Co., Baton Rouge, La., capital $25,000, to conduct a heating and plumbing business.

W. J. Kewin, Rochester, N. Y., capital $10,000, to take over the heating and plumbing business of Mr. Kewin.

Shank-Coupland-Long Co., Flint, Mich, capital $10,000, to conduct a heating and plumbing business.

Pipe Coiling, Bending and Welding Co., Pittsburgh, Pa., capital $25,000, to manufacture heating and plumbing specialties. Incorporators: George Best and George H. Best of Oakmont, Pa.; and Henry W. Jacobs of Pittsburgh.

Leslie Heating Corp., New York, capital $10,000. Incorporators: A. B. Stupel, 1535 East 17th St., Brooklyn; P. A. Lee and L. L. George, of New York.

John B. Stickler Co., Louisville, Ky., incorporated to deal in heating and plumbing supplies and to conduct a heating and plumbing contracting business. Incorporators: John B. Stickler, John B. Stickler, Jr., and Andrew Vogt.

Contracts Awarded.

Peck, Anderson & Peck Co., Cincinnati, O., heating 18-story addition to the Union Savings Bank & Trust Co.'s building at

THE REAL ESTATE EDUCATOR

Containing inside information not generally known, "Don'ts" in Real Estate, "Pointers," **Specific Legal Forms for Sale, Exchange, Building and Suretyship Contracts, Bonds Mortgages, Powers of Attorney, Leases, Landlord's Agreements, Notice to Quit, Deeds, Chattel Mortgages,** etc. It gives in the most condensed form, the essential Knowledge of the Real Estate Business. What You Need to Know—What You Ought to Know—What You Want to Know About It, Placed at Your Fingers' Ends. How to Become a Notary Public or Commisioner of Deeds. This book is an inspiration to the indifferent and a stimulus to the ambitious. Apart from the agent, operator or contractor, there is much to be found in its contents that will prove of great value to all who wish to be posted on Valuation, Insurance, Measurements, Contracts, Mortgages, Leases and Evictions. The cost might be saved 500 times over in one transaction. 256 pages, cloth, postpaid, **$1.00.**

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1123 Broadway, New York City

Patented

Automatic Water Driven Air Exhauster for Maintaining a Vacuum in Heating Systems

A steam heating plant having a Paul Automatic Air Valve on each radiator, small air piping leading from the air valves, and Leonhard Air Exhauster for creating and automatically maintaining a vacuum in the air piping, accomplishes uniform, positive and noiseless circulation of steam or vapor without pressure, very great fuel economy, and highest heating efficiency obtainable. Write for further particulars to

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Sturtevant
(REG. U. S. PAT. OFF.)

AIR WASHERS

Sturtevant Air Washers thoroughly wash the air used for ventilating purposes, removing all particles of dust, dirt, obnoxious gases and other impurities, delivering the air clean and pure.

The orifices in the spray nozzles of Sturtevant Air Washers are so large that they do not clog. The lipped perforations of the eliminators exert a scrubbing action on the air, greatly increasing the efficiency of the washer. The large strainer area insures continuous operation for long periods without loss due to resistance. This permits the centrifugal pump to operate at low head.

Sturtevant Air Washers are a thoroughly proven product. They are installed in some of the finest buildings in this country, among which are the new building of the Bureau of Engraving and Printing at Washington, the Kansas City Terminal at Kansas City, the Standard Oil Building at San Francisco, the Bancroft Hotel at Worcester, and many others.

Catalog 225-V describes these Air Washers fully. It will be sent upon request.

B. F. Sturtevant Company

Hyde Park, Boston, Mass. - And all principal cities of the world.

Fourth and Walnut Sts., for $15,000. The plumbing contract went to Thomas Canary.

E. Daugherty Plumbing & Heating Co., Bowling Green, Ky., heating and plumbing First Baptist Church at that place for $6,000.

Anderson-Darragh Co., Pittsburgh, Pa., heating new market building in Pittsburgh, for $8,692. The plumbing contract went to John M. Tate Company at its bid of $4,825.

Lynn, Mass.—Bids were received as follows for the heating and ventilating of the city hall at Lynn: J. F. Morgan & Sons, Inc., $4,237; Reardon Bros., $4,929, and M. A. Dame & Son, Inc., $5,633.

Ferris Bros., Manchester, steam heating new Johnson Building on Main St.

Gillis & Geoghegan, New York, steam heating $170,000 apartment building on Bennett Ave., near 181st St., New York.

George T. Barnes, Newburgh, N. Y., heating and plumbing $100,000 Masonic Temple in Newburgh.

Wheeler-Blaney Co., Kalamazoo, Mich., heating and plumbing new Science Building for the Western State Normal School at Kalamazoo; also heating and plumbing for the new science hall of the Mount Pleasant Normal School and power plant for the latter institution. The two contracts amount to $30,000.

Pacific Heating & Engineering Co., Portland, Ore, was the low bidder for the heating and oil distributing installations for the U. S. Government barracks at Vancouver, Wash. The company's bids were for oil distributing system, $17,169; oil burners, $12,677; pipe line from dock to power plant, $1,637.

Rockford Heating & Ventilating Co., Rockford, Ill., heating and ventilating new high school building in Rockford for $2,625.

Jas. J. Horan & Co., Troy, N. Y., heating. ventilating, plumbing and vacuum cleaning systems for the new Proctor Theater in Troy.

G. W. Cunningham Co., Inc., Hartford, Conn., steam heating St. Francis Hospital in that city.

Downey Heating & Supply Co., Milwaukee, Wis., heating and ventilating Riverside High School for $29,461; Eighth Street School for $8,528 and the Park Street School for $8,750.

Bryce Heating and Ventilating Co., Toledo, O., steam heating and ventilating two public school buildings at Mansfield for $11,256; also the Union School at Upper

THE EIGHT-DAY AUTOMATIC
HONEYWELL TEMPERATURE REGULATOR

Thermostat lowers the temperature at night and automatically raises it in the morning. Saves coal—saves labor.

Wires are not connected to thermostat, but to a wall plate that thermostat fits over, making it instantly detachable.

Either a spring or non-wind electric motor is furnished with the Model 8. The spring motor is fitted with a spring that gives from 60 to 75 operations on one winding. The non-wind motor is fitted with a 6-volt DC electric rotary motor of the very highest type. Four ordinary dry batteries will easily operate the electric motor through one entire heating season without attention, or it will work successfully on electric light current reduced through a transformer.

The spring motor requires very little current to trip it. One dry cell practically exhausted will work it successfully, or it can be operated on electric light current through a low voltage transformer. Either of the above motors are practically noiseless in operation and have ample power to handle the heaviest heater dampers, gas or steam valves. There are many new and original features embodied in the very high grade 1914 line of Honeywell Temperature Regulators, all of which are fully explained in our new regulator catalogue which we will be pleased to mail upon request.

HONEYWELL HEATING SPECIALTY COMPANY
WABASH, INDIANA.

Reliable Thermostats

Actual Positive Action for Valves
Actual Intermediate Action for Mixing Dampers

JOHNSON SERVICE COMPANY

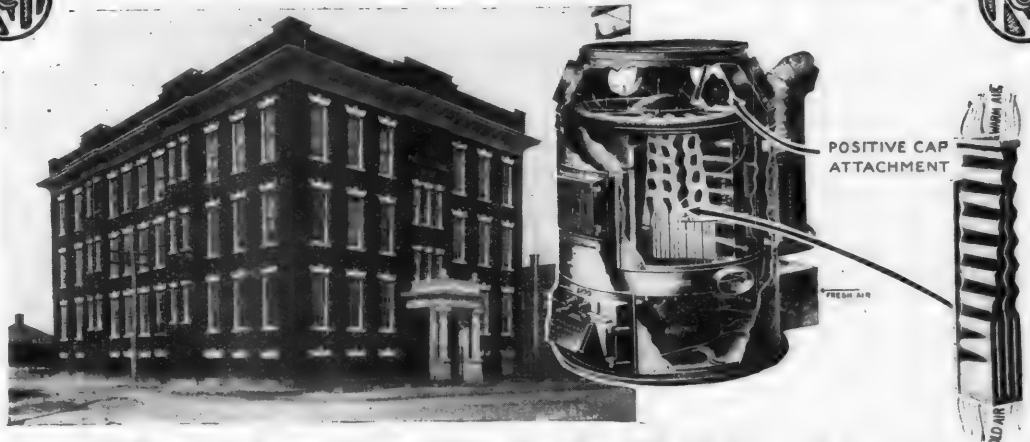
JOHNSON SYSTEM

TEMPERATURE JSC REGULATION

FIRST in the field — in efficiency — in size.

Offices in All Large Cities

NOTICE—We are the owners of Patent No. 924,235 relating to the automatic control of humidity. Infringers and unlicensed users will be prosecuted.



Why Kelsey Heat Works So Well For Schools

The school laws of today demand, that for every pupil, 40 cubic feet per hour of pure warm air be delivered to each room. This means that large volumes of fresh heated air must be delivered at a high velocity and in constant quantities.

It's no difficulty to meet the requirements for the quantity of air; but to have it heated to the right temperature, that is where the hard tug comes. Some systems do with difficulty meet these requirements; but the amount of coal burned is prohibitive.

This 24-room school building is supplied with Kelsey Warm Air Generators which deliver 30,000 cubic feet of air per minute. Send for particulars.

THE KELSEY
WARM AIR GENERATOR

Dealers in all principal cities.

Chicago, 2767 Lincoln Ave.
Syracuse, N. Y., 303 James Street
New York, 103-F Park Ave.

Sandusky for $8,020, public school building at Rossford for $6,544 and high school building at Redford, Mich., for $3,918.

H. W. Elliott Heating Co., Princeton, Ill., heating and ventilating new high school building at Warren, Ill.

Bartley-Kennedy Co., Pittsburgh, Pa., steam heating new building for the Pittsburgh Model Engine Company on Lexington Ave.

Walworth-English-Fleet Co., Boston, Mass., heating and ventilating Oxford School at Fairhaven for $3,777. The plumbing contract went to E. P. Hirst, of New Bedford, at his bid of $2,035.

Merrimac Supply Co., Lawrence, Mass., heating new police station at Lawrence for $3,086. The plumbing contract went to Riley Bros., of Lawrence, at their bid of $6,824.

Canton Plumbing Co., Canton, Ill., heating and plumbing new Burlington passenger station at Canton.

Kutner's, Fresno, Cal., heating and ventilating shop building at the high school for $2,757.

Stone & Underhill, Inc., Boston, Mass., heating and ventilating eighth district school at South Manchester, Conn., for $6,000.

Boston, Mass.—Bids were received as follows for the heating of the remodeled state armory at Springfield: A. J. Smith, Springfield, $3,225; George H. McLean, Springfield, $3,200; Holyoke Power Co., Holyoke, $2,981; Wychoff & Lloyd Co., Springfield, $2,825; Jennison Co., Fitchburg, $2,666; Miller Bros. Co., Springfield, $2,565. The plumbing bids were: George Smith Co., Springfield, $5,871; W. J. Hyland Co., Springfield, $5,200; Wychoff & Lloyd Co., Springfield, $5,198; Donohue Bros., Springfield, $4,831; J. J. Cotter, Springfield, $3,992.

Louisville, Ky.—Bids were received as follows for the heating and ventilating of the Louisville Boys' High School building, the general contract for which went to Bailey & Koerner, of Louisville, at their bid of $214,250; H. Netherton & Co., Louisville, $43,490; F. A. Clegg & Co., Louisville, $43,850; P. H. Meyer, Louisville, $44,288; A. J. Anderson & Co., Louisville, $43,241; F. S. Schardein & Sons, $45,033; Neville, Kellner & Co., Louisville, $40,920; Shiras Electric Co., St. Louis, Mo., $58,410. The contract was awarded to Neville, Kellner & Co.

W. T. Smith Co., Elko, Nev., heating and plumbing new Nevada Industrial School building for $6,723.

J. F. Gambrell, Mountain Grove, Mo., heating and plumbing new high school building at that place for $2,553.

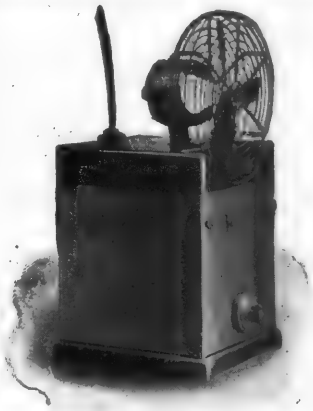
J. J. Hanighen, Omaha, Neb., heating city hall, at Omaha, for $12,750.

G. W. Ensley, Chariton, Ia., heating and plumbing addition to Garfield school building at that place for $2,667.

G. H. Sutherland Co., Walla Walla, Wash., heating and ventilating high school building at that place for $12,297. A plenum fan blast system will be installed.

Business Troubles.

U. S. Light & Heating Co., Niagara Falls, N. Y., has been placed in the hands of a receiver by Judge R. Hazel in the Federal Court in Buffalo. The company is a $17,500,000 corporation engaged in the manufacture of car heating and lighting systems. The application for the receivership was made by Frederick R. Humpage, one of a committee of three appointed last December by a minority stockholders' committee to investigate the operations of the company. Mr. Humpage said the company is solvent and will continue so if properly managed. He criticised many of the acts of the directors, which, he alleged, dissipated the funds of the corporation. The assets of the company were placed at $3,000,000 and liabilities at $900,000. The United States Light & Heating Co. is a marine corporation, organized in December, 1908, as the successor to the National Battery Co., the Bliss Electric Car Lighting Co. and the United States Light & Heating Co. of New Jersey. It owns patents on storage batteries used to light and heat cars, and also manufactures carheating and lighting apparatus. It has outstanding $12,600,000 common stock and $2,500,000 preferred stock. Charles R. Starbuck, president of the New York Air Brake Co., is chairman of the directorate. The other directors are Newman Erb, Theodore P. Shonts, Frank P. Frazier, William P. Hawley and J. Allen Smith, who is president. The company was organized under the leadership of the late Edwin Hawley and for a few years was regarded as very prosperous. Its main property is at Niagara Falls. Several months ago Frederick R. Humpage, Guy M. Walker and John A. Steiches were named as a preferred stockholders' investigating committee, and they found that the company needed working capital. The financing methods employed are said to have been criticised in the committee's report, which recommended the issue of bonds to obtain funds to tide the company over. The stockholders were asked to subscribe, the right to subscribe expiring July 15. The success of the bond issue was deemed improbable and the receivership decided upon.



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Keeps the Air Pleasant and

WHOLESOME

The Sprague Electric Ozonator is the culmination of long experience and the most successful apparatus for eliminating unpleasant odors and freshening the air in crowded rooms, stables, factories, etc. If you are interested in the air you breathe let us send you a copy of ozone bulletin No. A83. Send us your address now. There is no obligation whatsoever.

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Boiler Copings and Foundation Caps for Motors, Pumps, Fans and Blowers

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Dixon's Graphite PIPE JOINT COMPOUND

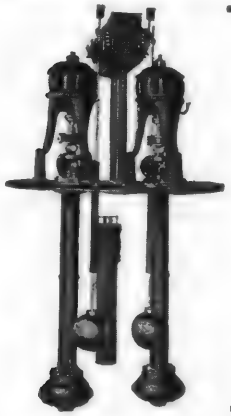
Is not a cement, but a lubricant that makes easy the setting up and taking down of pipe joints.

Send for Booklet No. 311.

Made in JERSEY CITY, N. J., by the

Joseph Dixon Crucible Co.

Established 1827



Why the Chicago Pump Company's Automatic Electric Bilge Pumps and Sewage Ejectors are the Highest Grade on the Market of Today.

Write for specification folder and Bulletin 18

Chicago Pump Company, 911 W. Lake St., Chicago.

Please mention THE HEATING AND VENTILATING MAGAZINE *when you write.*

Hudson River Plumbing Supply Co., Newburgh, N. Y., has failed, with liabilities of $17,135 and assets of $17,531, consisting of real estate $15,000 and accounts $2,531.

Trade Literature.

ATLANTIC RADIATORS, made by the Atlantic Radiator Co., Huntington, Pa., are featured in a new vest pocket catalogue which illustrates and describes the company's extensive line of direct radiators. A map accompanying the catalogue shows by means of concentric circles the central location of Huntington with reference to important points in the East. Size 3½x6 in. (standard).

MODERN HEATING FOR THE HOME is the title of a cleverly-prepared catalogue devoted to the Hutchison system of vapor heating, sold by the Hutchison Vapor Heating Corporation, Herndon, Va. After describing at length the principle of operation (the construction of the vapor valve was illustrated in last month's issue), the catalogue takes up the different parts of the system, including the vapor valve, damper regulator and trap-receiver. Complete installation directions are given, supplemented with an illustration of a typical residential installation. Rules are also included for proportioning radiation for this system. The company guarantees its devices. Size 6x9 in. Pp. 16.

A SMALL ELECTRIC FAN THAT VENTILATES is the title of a new catalogue issued by the American Blower Co., Detroit, Mich., devoted to the "Ventura" reversible electric fan. This fan is designed especially for the ventilation of small offices, kitchens, apartments, etc., at a moderate cost of installation and low operating expense. One of the illustrations shows a 12½-in. "Ventura" fan, motor driven, with housing, reversing mechanism, wiring from motor to receptacle on frame, ready for electrical connections to the ordinary house current. The ingenious reversing mechanism makes it possible to discharge the air in various directions. It is made in eleven sizes with wheels from 11 to 48 in. in diameter. Size 3½x6¼ in. Pp. 12.

H.P.Equipment

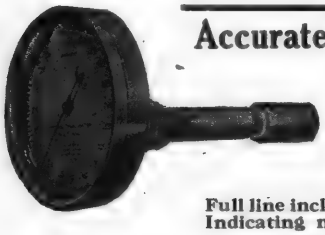
Spencer Turbine Vacuum Cleaners

are manufactured in sizes from ¾ H. P. to 40 H. P.

Send for catalogue

SPENCER TURBINE CLEANER COMPANY

HARTFORD, CT.



Accurate Service Is Assured When You Use

Standard Indicating and Recording Thermometers

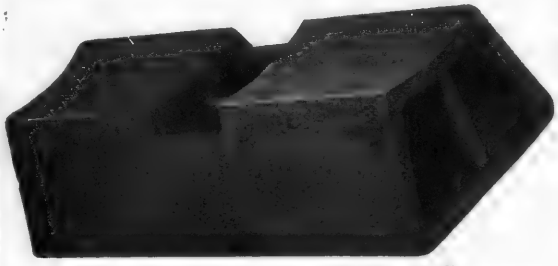
Guaranteed Correct

Full line includes seven types of recording thermometers and a special line for mechanical uses. Indicating mechanical thermometers are furnished with extensions from 2 to 30 in. in length.

All thermometers are double and not breakable.

STANDARD THERMOMETER COMPANY Clinton and Shirley Streets **BOSTON, MASS.**

RIC-WIL METHOD INTERLOCKING BASE DRAIN



Length 2 feet 6 inches. Weight 105 lbs.

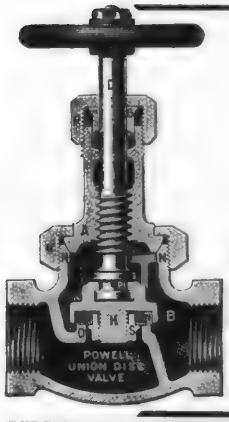
INSURES a substantial support and dependable under-drainage for RIC-WIL method of insulating underground steam pipes. Laid to grade on a concrete foundation, RIC-WIL METHOD is always in perfect alignment.

Write for book on installation.

RIC-WIL UNDERGROUND PIPE COVERING CO.

623 New England Bldg.,

CLEVELAND, - - - - - - - OHIO



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FOR HOT WATER OR STEAM HEATING

Five Points of Efficiency Combined in the POWELL Union Composite Disc Valves

1. Body symmetrically designed and well-proportioned. 2. Metal distributed to meet most wear. 3. Union bevel ground joint connection between body and bonnet, red lead or cement unnecessary to make them tight. 4. Disc-holder "H" permits the use of any make of rubber discs. 5. All parts made to gauge and are interchangeable.

Ask your dealer for "POWELL" VALVES or write us.

THE WM POWELL CO.

DEPENDABLE ENGINEERING SPECIALTIES

CINCINNATI, O.

STEEL TANKS

For All Purposes

Riveted Tanks
Welded Tanks
Brazed Tanks

Founded 1802- -112 Years Old

Wm. B. Scaife & Sons Co.

NEW YORK OFFICE
26 Cortlandt Street

Pittsburgh, Pa.

Jolly Up "Slats"

This heating game isn't a game at all—if you get **started right,** with the **right system.**

Follow "Shifty." He got the right hunch. And the way it all happened is this. Shifty was a good contractor, but he had some old fashioned steam or hot water system in his kit. It didn't take him very long to wise up the fact that kicks were coming in on his jobs. That no matter how careful he was, kicks kept on coming in—because he nor any other contractor could with ordinary steam or hot water heating, deliver the results that are expected nowadays.

"Shifty" is looking around for something better hit on the

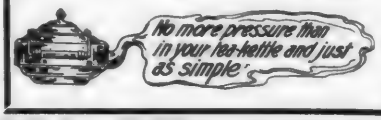
MOLINE SYSTEM OF HEATING

The Moline people gave him facts, real proof of Moline superiority. They told him straight from the shoulder just why Vapor Heating by the Moline System is the one real warming proposition on the market. Better for users because they get more warmth with less cost; better for the contractor because with it he's got the shade on every competition when it comes to a show-down of quality.

(Signed) THE MAN WHO KNOWS.

Send a postal today for the FACTS we've got for you.

Moline Vacuum Vapor Heating Co.
Dept. P. Moline, Ill.



BETWEEN THE TWO COVERS OF

Scientific Building Operation

you will find a half hundred articles written by the best authorities on building management in this country. Here are some of the subjects:

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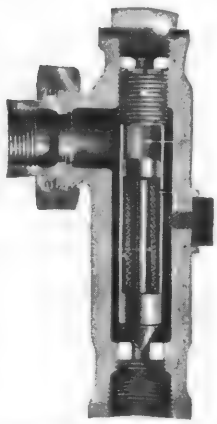
PATTERSON PUBLISHING CO., 918 City Hall Square Building, Chicago

J-M POWER EXPERT for June, 1914, published by the H. W. Johns-Manville Co., Cleveland, Ohio, contains, among other things, an article describing the insulation work in the Hotel Gibson, Cincinnati, O., where $15,000 worth of J-M insulation was used.

M-H IRON AND BRASS COCKS FOR STEAM, WATER AND GAS, made by the McNab & Harlin Mfg. Co., New York, are the subject of newly-issued monthly bulletin of products which this company publishes at intervals. Sizes 5x7 in. Pp. 10.

SARCO VACUUM VALVE, a modification of the well-known Sarco steam trap, a device made by the Sarco Engineering Co., 116 Broad street, New York, is illustrated and described in newly-issued circular matter. As will be seen from the accompanying illustration, it consists of a pipe body which occupies little space and takes the place of a radiator elbow. In this body a patent cartridge is inserted, containing an easily expandible fluid which will not freeze at the lowest atmospheric temperature. The fluid operates a corrugated tube, to the lower end of which is attached a piston which carries the valve head.

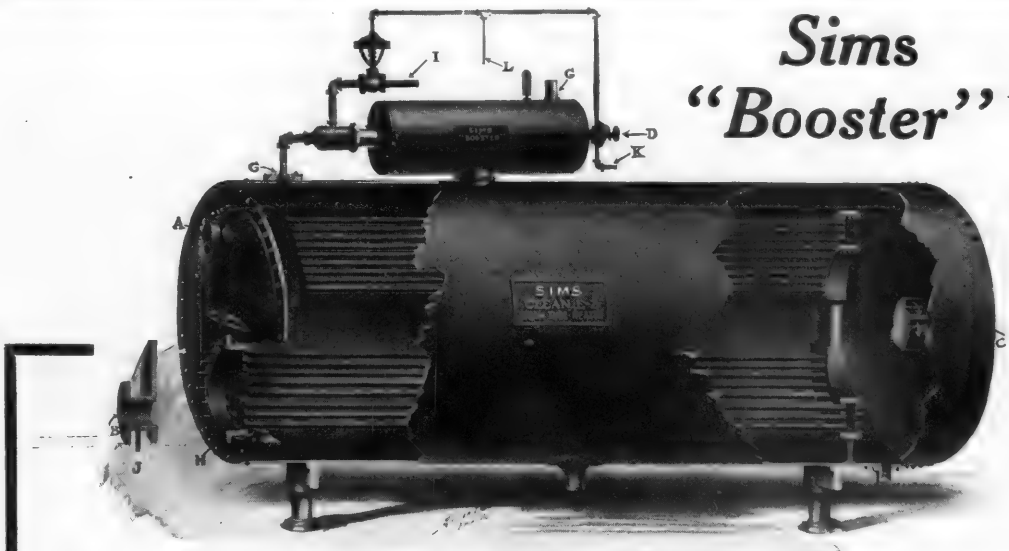
As soon as water collects the liquid within the cartridge contracts and the valve opens. The condensation which has collected is drawn out by the suction and when steam comes in contact with the cartridge, there is an expansion and the valve closes, maintaining a vacuum within the system. The Sarco vacuum valve is furnished in sizes ranging from ⅜ in. to 1 in. diameter.



CONSTRUCTION OF SARCO VACUUM VALVE.

WANTED.

Wanted.—Salesmen calling on plumbing jobbers wanted to handle paying side line, good commission basis. Milner-Bill Company, 59 Fort St., Springfield, Mass.



Sims "Booster"

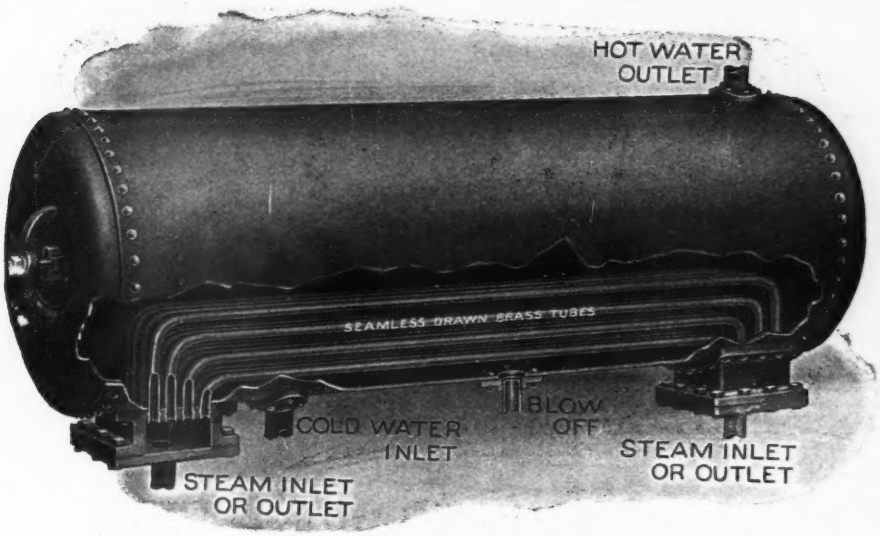
SIMS STANDARD CLEAN E-Z HEATER, EQUIPPED WITH SIMS "BOOSTER"

NO NEED TO USE STEAM IN YOUR LAUNDRY WASHERS

The "Sims" Booster will give the desired water temperature as it leaves the heater, and **will save the usual wear caused when steam is used in the washers.**
Thermostatically controlled. Can be attached to either Standard or Style "L" Heaters.
For use when steam pressure is 15 lbs. higher than water pressure.

Send for Bulletin VL-1, containing particulars.

THE SIMS COMPANY ERIE, PA., 18th St.



Patented Aug. 26, 1913

TYPE C

THERE IS NO IDLE HEATING SURFACE

IN THE

PATTERSON
HOT WATER TANK

for heating water for domestic or manufacturing purposes

When steam enters the **Expansion Chamber,** it expands and uniformly fills the tubes, whose combined cross-sectional area is several times that of the steam pipe. As rapidly as the steam condenses, due to transmitting its heat to the surrounding water, it is discharged into the **Condensation Chamber.**

The Condensation Chamber has sufficient area to provide for any sudden increase of condensation without permitting it to back up into the tubes to destroy their heating efficiency.

The heating surface in the Patterson Tank consists of a number of parallel seamless drawn brass tubes, both ends of each being expanded into heavy cast iron tube-heads with an improved roller expander. Their ⊂⊃ shape provides for the free contraction and expansion of each individual tube without straining, so there is no danger of leakage.

Any combination of storage and heating capacities can be furnished.

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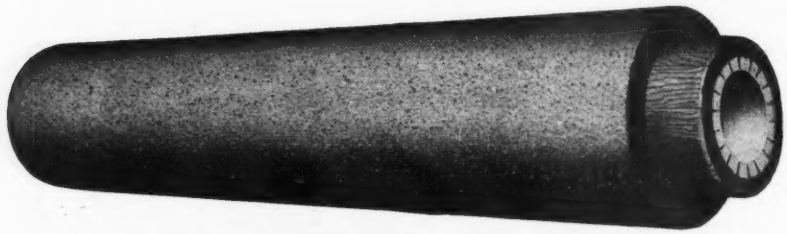

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OF SATISFACTORY INSTALLATIONS ARE BEHIND

MICHIGAN UNDERGROUND PIPE CASINGS

SIX REASONS

Why the "Michigan" System of Underground Pipe Insulation is the simplest, most durable and most efficient casing on the market.

1. **Thick, Solid, Non-Conductive Wood Shell.**
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Made throughout of Michigan pine and tamarack

Shipped ready to lay—they make a driving fit

Write for our book on
"Michigan Waterproof Wood Casings."
It tells all about them.

MICHIGAN PIPE CO.

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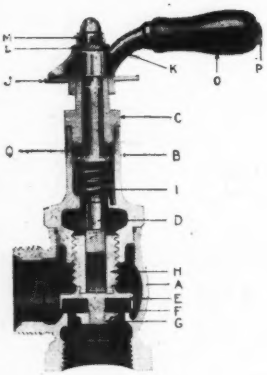


Style No. 32

A—Body	J—Dial Plate
B—Bonnet	K—Lever
C—Top	L—Stem Nut
D—Stem	M—Stem Lock Nut
E—Disc Holder	O—Wood Handle
F—Disc	P—Screw
G—Disc Nut	Q—Stem Steam Seat
H—Disc Carrier	
I —Spring	

IS IT WORTH WHILE?

Most people unconsciously ask this question of themselves when they are considering the use of an article they are not very familiar with, and, ten chances to one, it will go unanswered unless some one forces them to make a decision.

This cut sectional view of the

SYRACUSE PACKLESS RADIATOR VALVE

with graduated dial and lever handle will enable you to see at the first glance the SIMPLICITY of its construction and the well proportioned body metal lines.

You will be further interested to know that we will send you

A CUT SAMPLE postpaid for your careful examination. Give us your answer promptly.

ARCHITECTS, SEE SWEET'S, PAGE 1227

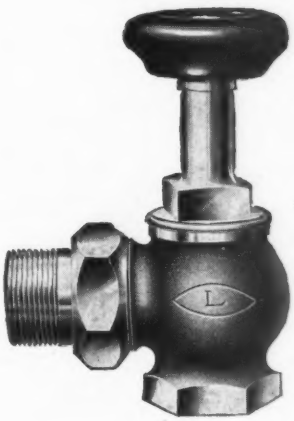
CONTRACTORS / OWNERS — *Send for "Inside Information on The Syracuse Packless Radiator Valve"* — IT'S FREE

SYRACUSE FAUCET AND VALVE CO., SYRACUSE, NEW YORK

N. Y. OFFICE, 220-224 West 42nd St. **GEO. A. WELD CO., 79 Milk St., BOSTON**

LAVIGNE
Packless Steam Radiator Valve

"The" Valve Without a Doubt



There can be no doubt about

The advisability of using radiator valves which positively do not leak steam, air, or water.

The sense of using a valve action which completely opens or completely closes with but 7/8 turn of the handle.

The looks of the job being improved by using valves of standard height. Shapely, symmetrical, well balanced good looking valves enhance the beauty of any installation.

The working and wearing qualities of a valve which has been approved by the trade for over seven years; which is not an experiment and has stood the test of time.

The convenience of having a valve which can be used in any position; behind grills, in corners; with graduated features, and with lock shields.

Lavigne Packless Quick Opening Steam Radiator Valves satisfy every need of the Owner, Architect, Engineer, Steam Fitter, or Janitor.

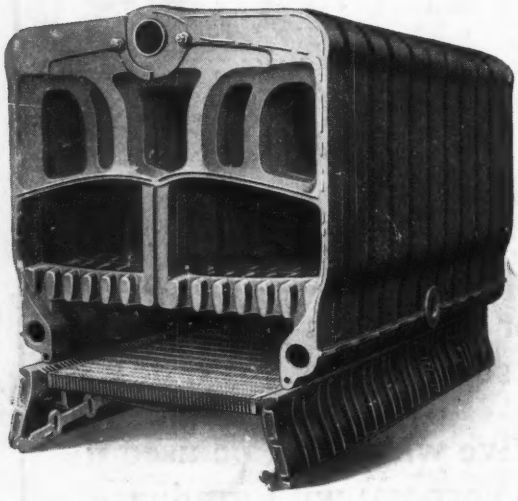
Ask your jobber for details.

LAVIGNE MANUFACTURING COMPANY, DETROIT, MICHIGAN

Turn Smoke Cost into Heating Profit

Enterprising heating contractors will find that there is a big opportunity for heating profit in pointing out to property owners the high cost of smoke. The chief smoke inspector for Chicago declared in 1913 that the smoke nuisance in that city was responsible for an annual financial loss of $17,600,000, or $8.00 per capita. In other large cities the loss has been estimated as high as $24.00 per capita. But that is not all—smoke itself is wasted fuel. It is the property owners money—good heating value—being thrown away up the chimney.

IDEAL Smokeless Down-Draft Boilers



View of a No. 6120-S Ideal Smokeless Down-Draft Boiler for Steam, with front section removed to show divided sections for easy erecting, and the water grate in two parts, terminating at center in two vertical columns which increase the direct fire to water surface.

burn cheapest grades of free-burning soft coal without smoke. They get the full heating value out of the coal, and make compliance with city smoke ordinances not only ***easy*** but ***profitable*** to the property owner. So successful have these boilers been in accomplishing these results, that we have again found it necessary to increase the line in order to meet the growing demand for smokeless heating. The big "60" series have steam capacities from 7,000 to 12,000 square feet, and water capacities from 11,200 to 19,200 square feet. These boilers, either singly or in batteries of two or more will supply almost any heating demand. Look into the fuel prices in your locality and you will be pretty sure to find convincing sales arguments that should help you to make some big boiler sales. Try it out—handsomely illustrated catalogue, free on request

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